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Electroplating for 62 Years

The Rise of Walter E. Hague and Son of Pittsburgh, Pa., One of the Oldest Job Plating Establishments West of the Alleghenies

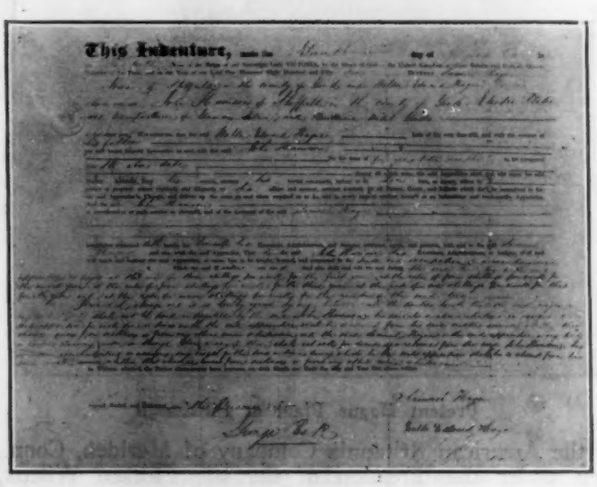
THE firm of Walter E. Hague & Son, as such, dates from the year 1901 when the present head of the business, Walter L. Hague, was taken into the firm; but as an established job plating institution, its history goes back to before 1869 when "Walter E. Hague, Gold and Silver Plater" first hung out his shield on water

At Left. Walter E. Hague, Founder of Old Job Plating Firm Which Is the Subject of This Article.

At Right, the Certificate of Indenture for the Apprenticeship of Walter E. Hague in 1856.

Street, Pittsburgh, Pa. It was in 1856 when Walter E. Hague, son of Samuel Hague, became apprenticed to one John Harrison of Sheffield, and the original indenture of this apprenticeship is now the treasured possession of W. L. Hague. It is reproduced herewith (see cut) and reads as follows:

"THIS INDENTURE, made the Eleventh day of December in the Twentieth year of the Reign of our Sovereign Lady VICTORIA, by the Grace of God of the United Kingdom of Great Britain and Ireland, Queen, Defender of the Faith, and in the Year of our Lord One Thousand Eight Hundred and Fifty Six, Between Samuel Hague, Joiner, of Sheffield, in the county of York, and Walter Edward Hague, his son, of the one part, and John Harrison of Sheffield, in the county of York, Electro Plater and manufacturer of German Silver and Brittania Metal Goods, of



the other part: WITNESSETH that the said Walter Edward Hague hath of his own free will, and with the consent of his father, put and bound himself Apprentice to and with the said John Harrison for the term of five years and ten months to be computed from the above date during all which term said Apprentice shall and will serve his said Master faithfully, keep his secrets observe his lawful commands, forbear to do him hurt, or injury,

either in person or property, attend regularly and diligently to his affairs and interest, account honestly for all Money, Goods, and Effects which shall be committed to his, the said Apprentice's Charge and deliver up the same as and when required so to do, and in every respect conduct himself as an industrious and trustworthy Apprentice. And the said John Harrison, in consideration of such service as aforesaid, and of the covenant of the said Samuel Hague hereinafter contained, doth hereby for himself, his Executors, Administrators, and Assigns, covenant, agree and promise, with and to the said Samuel Hague and also with the said Apprentice, That he, the said John Harrison, his Executors, Administrators or Assigns, shall and will teach and instruct the said Apprentice, or cause him to be taught, learned, and instructed in the trade and occupation of a warehouseman which the said Master now uses; and also shall and will for and during the said term pay to the said Apprentice as wages at the rate of three shillings per week for the first year, at the rate of four shillings per week for the second year, at the rate of five shillings per week for the third year, at the rate of six shillings per week for the fourth year, and at the rate of seven shillings per week for the residue of the said term. Provided always, and it is hereby agreed by and between all the parties hereto, that the said wages or any part thereof shall not be paid or payable by the said John Harrison, his executors, administrators, or assigns, to the said apprentice for such time or times as he the said apprentice shall be so absent from his said masters service whether that absence arises from sickness or from any other cause whatsoever and the said Samuel Hague, or the said apprentice, or any party or parties claiming under or through them or any of them shall not ask for demand or assigns, any wages for the time or times during which he the said apprentice shall be so absent from his said masters service whether that absence arises from sickness or from any other cause whatsoever."

Though he started to work at 75c per week and finished at $1.75 a week, Walter E. Hague must have learned more than plating during those years, for within two years after the completion of his apprenticeship he migrated to the United States with its promise of greater opportunity.

He landed in New York in the winter of 1863 and worked in the Springfield Armory for the duration of the Civil War. When peace was declared he was employed

Present Hague Plant at Pittsburgh

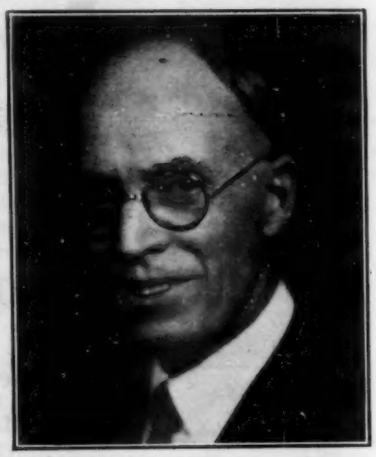
by the American Britannia Company of Meriden, Conn., then under the direction of the late Horace Wilcox, as foreman of the plating as well as the hard and soft metals departments. During each of the three following years he made a trip to Sheffield, England, to bring back skilled workers in hard and soft metal.

In 1868 he went to Chicago to take a job in a plating shop. (It is of passing interest to know that in this same shop B. Mercil, who later organized the successful mechanical plating shop of B. Mercil & Son, then worked as a boy.) Evidently Mr. Hague did not like the prospects of his new opportunity in the growing mid-western metropolis for we find him on his way back East that same year. He stopped off at Pittsburgh and it was here, in May, 1869, that he opened his own shop, specializing in gold and silver plating.

While there are no records available, it is evident that the business prospered for his shop moved six times during the period between 1869-1901, each time because of urgent need for more space.

The present Walter L. Hague joined his father in 1889 —the year of the Johnstown flood—and became a partner in the firm in 1901 when the business was moved to the Arrott Power Building, on Barker Place.

Walter E. Hague died in 1912. In 1925 the business was moved to its present location at 100 Liberty Avenue (See cut). Here two floors are devoted to all forms of plating but despite the advent of cadmium and chromium, with their influx of new business, silver plating continues to produce a considerable proportion of the firm's annual revenue.



W. L. HAGUE,
Present Head of the Firm

Sixty-two years of continuous operation is a splendid record for any business. There must be fundamental reasons for such success in the field of job plating so THE METAL INDUSTRY asked Mr. Hague to interpret those reasons for its readers. His statement which follows should be of particular interest to all proprietors of job plating shops:

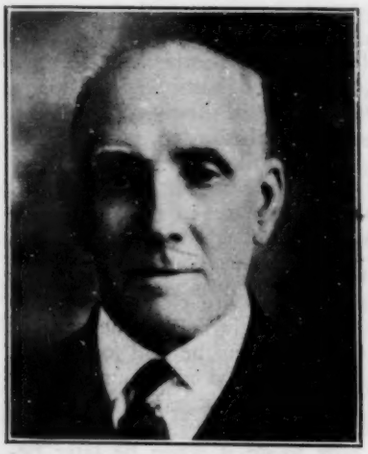
"My father was a thoroughly human person. He liked people and wanted people to like him. And customers were people to him—people interesting to know —so he made it his business, insofar as he was able, to meet every customer. As I grew up in the business he kept repeatedly telling me, 'The job plating business is a personal business. Meet your customers. Know them. Give them your honest advice. If the work can't be done, tell them so. But always make them feel you are taking a personal interest in the work they want done—and see that you do.' That has become the cardinal principle of our business.

"Many customers frown when the price is mentioned. We frankly tell them the reasons why for our charges. Nine times out of ten the customers can be made to understand that you are not trying to rob them. Other customers want to know if it is worth while to refinish certain treasured articles. If we know that the work cannot be done—that it would not look well—we frankly say so. If he doesn't leave the work, he'll surely return with the next job he wishes done.

Labor

"The labor question has never been a problem with us. We never had a man leave our employ who wouldn't come back if he had the opportunity. Our oldest employee, Jimmy Martin, who died during the past year, had

been with us since 1879. Clyde Baker, silver plater, has been with us thirty years. George Schaefer, in charge of our chromium operations, started in 1915. Freddie Volz, nickel plater, and Joe Barleman, receiving and shipping clerk, began as messenger boys eleven years ago. Our employees are the people who must do the work which in the end will either please or displease our customers.



JAMES MARTIN,
Who Was with the Hague Firm for 51 Years

It has therefore always been our policy to insist that the men take pride in their work and to reward them accordingly.

"Cleanliness was another point that father insisted on with vehemence. As a result, we have never had a solution sore in the whole existence of our business.

Contract Work

"We never liked contract work because it always encouraged putting all the eggs in one basket. We had one contract that ran seven years. At its completion we did not have over 150 customers on our books. It took us fifteen years to get back to our old position of serving thousands of customers whose orders, while small, represented a steady source of income. That one blow convinced us of the fallicy of accepting contract work which took up the greater part of our production.

Pricing

"Father had two rules which governed his entire policy with respect to prices which must be charged for work done. (1) Never cut a competitor's price for the sake of taking business away from him; (2) Don't be afraid to refuse work if you cannot make a profit. Those rules have been rigidly adhered to because they have proved their merit over a period of more than a half century. The fact that we today have customers on our books who have been with us since the beginning is, in my opinion, due entirely to this policy.

"Every job which comes into our shop is time-clocked. This is essential because labor is the most important factor in computing the cost of work done. For example: We have been doing a certain job for forty years. The work would come in, all at one time, averaging anywhere from 5 to 1500 pieces, all alike. Forty years ago we recevied 18c a piece. The last lot, finished within the past ten months, cost 55c a piece. This difference in cost is due largely to the increased cost of polishing. Forty years ago we paid the polisher on this job 25c an hour for a ten hour day. Today we pay $1.00 an hour for an eight hour day, and have to make some of our profit out of the improved methods in polishing.

"Through our long years of service we have been able to compute the prices on practically all classes of work which may pass through a job plating shop. There is nothing "by guess and by gosh" about it because a job plater can't afford to guess and expect to stay in business.

"A job plating business such as ours can never be made a million dollar business, but it can be made to produce a steady and respectable income year after year; and be intensely interesting because of the diversified work done and the people one meets. This latter feature was the most interesting to my father and has proved so to me."

Testing Screens for Abrasives

THE Technical Committee of the Producers of Electric Furnace Abrasives has just completed a research program at the United States Bureau of Standards, on the subject of calibrating Testing Screens, and have prepared and distributed to each member standard grit sizes for use in the calibration method, which they have also adopted as a result of this research work. The work was carried on by Mr. V. deSveschnikoff, Research Associate selected by the Director of the Bureau, and the expenses were borne by the Committee of which the membership is made up of the following firms manufacturing electric furnace abrasives:

Abrasive Company
American Abrasive Company
American Emery Wheel Works
The Carborundum Company
Exolon Company
Federal Abrasives Company
General Abrasive Company
Norton Company

The usual certified screens of the Bureau were found to be too inaccurate for Abrasives testing master screens of closer tolerances were selected and deposited at the Bureau to assist in future selection of test screens for the manufacturers and users of loose abrasives.

This is an excellent illustration of the constructive work that is possible through cooperation within an industry.

This same Committee was largely instrumental in securing adoption of Simplified Practice Recommendation No. 118, which covers specifications for sizes of Electric Furnace Abrasives.

Coppering Mirror Backs

Q.—Please give us information on coppering the backs of silvered mirrors by immersion or by pouring a solution over the mirror backs.

A.—Write to the Superintendent of Documents, Washington, D. C., for a copy of circular No. 389, entitled "The Making of Mirrors by the Deposition of Metals on Glass." The price of this circular is 5 cents and it explains the method in detail. —O. J. S.

A Brass Foundryman's Progress

By OTTO GERLINE
Gerline Brass Foundry Company, Kalamazoo, Mich.

How a Boy Grew Up to Be a Brass Foundryman. His Adventures, Joys and Sorrows, as Told to W. J. Reardon. — Part 6*

DEAR Billy:—
To continue my tale of woe.

The next year I became a general all-around brass foundry laborer. I learned to cut off and clean casting, carry and set cores, mix facing, help the furnace tender, help pour off, shake out, temper and riddle sand, etc. In the meantime, I kept my eyes on the molders. I would ask permission to work on the bench whenever an opportunity presented itself. I would come in an hour earlier in the morning and temper and riddle the sand for one of the molders working piece work, just for the privilege of making a few molds on his bench before starting time in the morning. I would eat my lunch piecemeal during working hours so as to have my noon hour to work on the bench, molding again. In this way I got so I could make ordinary castings from gated and plate patterns. This attracted the attention of the foreman and so whenever a molder laid off for any reason I was put on molding until such time as he returned to work again. In this way I learned a little about molding. I learned to make stuffing boxes, stems, bonnets, and nuts and washers for gas and steam cocks. I next was allowed to make valve bodies. This was considered a better grade of molding and I was some proud kid when I poured off my first heat of 1" globe valve bodies, and learned how to put on the rich natural color that virgin metal produces. Next, I tried my hand at loose work, sometimes called jobbing work. On this particular kind of work I am still learning to this day, and will continue to do so no doubt until St. Peter has me pour my last heat.

While I am writing this I would like to say a few things to the boy or young man who intends to take up brass foundry work for a living, and one who is ambitious to get to the top as either foreman, superintendent, manager or proprietor. Don't slight any of your work as a laborer. Become a first-class all around man and it will sure pay you in later years when you are at the top. A good laborer knows how to cut off castings; he knows how to do it quickly and thoroughly. He learns of the different mixtures of metals used in the foundry so as to enable him to return gates, sprues, risers and defective castings to the furnace room, or stock room, which ever the case may be, in the proper order and not all kinds of metals mixed up together as is usually done. If you think a minute you will agree that it pays to do this. He will at all times keep his saws, chisels, cutting machine knives, etc., in good condition. He will keep his emery wheels dressed, keep his machinery line shafts, etc., tightened up, cleaned and oiled. If he is a bright young fellow he will learn to do minor repairs on machinery and save many a dollar for his employer. If he is really good he will see that the windows are cleaned every so often and so reduce the electric light bill. The care of flasks and flask boards is also an item he will look after.

In fact, personally, I believe a good all around handy brass foundry laborer is one of the best assets a foundry can have. If he learns these things thoroughly he is in a position to teach others how to do it when he later becomes a foreman or superintendent. It certainly is a fact that if you don't know how to do these things properly you cannot show any green men how it should be done. A lot of young men think themselves above such work at the time only to regret it later on. It's the little things that count and sometimes they are the things that spell success or failure.

To foundrymen I would say, my hat is off to the bright brass foundry laborer. Pay him a little more money to keep him interested and he will pay you a nice dividend.

My next job was helping the furnace tender. The furnace tender, or melter, in my opinion is the foundry owners' best bet. To get an intelligent man, strong enough to stand the heat and wear and tear of this job, who also has brains and uses them, has always been my hardest job in my thirty-five years as foreman, superintendent and proprietor. I know a number of foundries that employ cheap and ignorant foreign labor for this job, and kid themselves that they are making money by doing so. They usually make the mistake of their lives when they do this. It makes no difference whether you run a battery of the old style coke furnaces, oil or electric furnaces. It is an interesting study and one to which the young man learning the business should give all he has in him. To understand the different metals, their uses and peculiarities is one of the most fascinating parts of the business.

The difference between a first-class furnace tender who understands his furnaces, crucibles and fuel, as well as his metals, and the ordinary guy who calls himself a furnace tender, because he can melt metals, "regardless of cost and quality of product," is as great as the difference between myself and Arthur Brisbane as writers. "Ain't that sum'ting?"

To the beginner, I would say, it is of course understood that the firm you are working for has the proper furnace arrangement, such as stack of proper height, flues of proper size, covers of the non-man killing type, the best of fire brick, and fire clays, or the best ram-in variety fire cement, otherwise you are helpless. If a furnace tender gets a job with such a firm he is in his glory, and he can at once begin to show his ability as such. He will see that his furnaces are kept patched up always. If he has some spare furnaces he will patch them up in his

* Parts 1 to 5 were published in our issues of July, 1929; November 1929; May, 1930; August, 1930; and February, 1931, respectively.

spare time, that is if he is not overloaded with other work. In that case his helper or any other foundry laborer should do this work under his instructions and supervision, if possible. Or, another way is to pay him to come in a half-hour or hour earlier in the morning and do this work himself.

In patching, remember that a stitch in time saves nine. Light patching and often is the best. It is surprising how much fuel you can save by following this system, and surprising also how long a good furnace lining will last. It will surely save money for the firm, and you know that no sane firm will fire you for saving them money. You will be in demand and that helps to get you a better position later on.

In lighting your fires in the morning use some old oily rags, a little kerosene, some kindling wood and your brains. Don't use a load of wood when a half load will do. Learn to light fires with as little oil and wood as possible for good results. Don't burn it up simply because you don't have to pay for it.

Next learn to melt metal with as low a fuel consumption as possible. Keep a record of fuel consumption for a while, and try to melt 100 lbs. of metal with as little fuel as possible. This is a big item and shows up at the end of the year in either red or black, according to the skill of the furnaceman.

And here you can work yourself into the good graces of the boss. Learn how to anneal crucibles properly, and try your best at all times to get as many heats out of them as you possibly can. Have two sizes of tongs: one pair for the crucibles when new, and one pair when the crucibles become worn.

Have your boss take a new crucible to a good iron foundry and have one cast in iron. Shape your tongs around this whenever needed. This saves crucibles. Learn to fire your furnaces so that when you are ready to lift out the crucible your tongs will slip over it with ease. Learn also to pack a crucible when melting so as not to crack them or strain them, and never use pick-up tongs to straighten a crucible in the furnace when full of metal. If you learn your trade properly you will not have to do this. Know your furnaces so that you can walk away from them and see in your mind just what's going on in any and all of them. When you open them to refire, recharge or take out the crucible, stand back and open the cover, let the heat go up and out the ventilator instead of you inhaling the fumes and hot air. It is more healthy for you this way. In plain words, a furnace tender who can run furnaces so as to get more heats out of a crucible, and melt more metal with less fuel, and whose ashes no one wants to buy because there is no metal in them, is the man that is on his way up the line. And now, if he is bright enough to find out what the molders are doing, the quantity of metal they will require, and the time they will be ready to pour and not melt 300 lb. of metal when only 180 lb. are needed, and melts his aluminum or white metals in a furnace after the heat of brass or bronze has been withdrawn, without much extra fuel, and when through pouring off will only have a few shovels of live coke left to burn out for nothing, he is climbing still higher in the estimation of his employer. And last but most important of all, is when he has the ability to pick out of scrap metals the hard and soft by using a file, other metals by breaking and looking at the fracture, others by acid test, when he can melt without burning, and without soaking, using the proper cup skimming and fluxing; then he gets to the position of the Prima Donna of the brass foundry, the most valuable man in the practical end of the foundry, and a man who can command, and should receive top wages. Then he is almost ready, together with a good molder and a good salesman to start in business for himself.

In my opinion the furnace tender is a real cog in the wheel, and a foreman or superintendent should have some experience as a furnace tender, or melter, as you wish.

In concluding this article, I think you will believe me Billy when I say, such a man can help you to save money.

Some road experience will come soon. Then you will have a good laugh.

This series will be continued in an early issue.—Ed.

Aluminum in the Racing Automobile

THE racing car "Blue Bird," driven by Capt. Malcolm Campbell last February set the worlds' record speed for automobiles at over 245 miles an hour. It carried a considerable amount of aluminum and light aluminum alloys, as follows:

Napier Engine: Pistons of forged "Y" alloy; crankcase of 2L5 alloy; carburetor body of R. R. 50 alloy; camshaft covers of R. R. 50 alloy; inpellor forging of R. R. 56 alloy; and rear cover of light alloy.

Chassis: Rear axle center casing, brake shoes, steering gear columns and castings and wheel disks.

Body: Panelling—over 600 sq. ft. of sheet aluminum.

The alloys named above are as follows:

"Y" alloy: Composition: Copper 4 per cent, nickel 2 per cent, magnesium 1½ per cent, balance commercial aluminum. Tensile strength of heat-treated forgings 50,000 lb. per sq. in. (minimum), elongation 15 per cent (minimum), Brinell hardness 100.

"2L5" alloy: This is a sand-casting alloy, the number being that of the British Engineering Standards specification. Composition: Zinc 13½ per cent, copper 2¾ per cent; balance commercial aluminum. Tensile strength, sand in cast form, 25,000 to 30,000 lb. per sq. in., with Brinell hardness 70.

R. R. 50 alloy: An alloy developed by Rolls-Royce. Composition: Copper 1.3 per cent, nickel 1.3 per cent, magnesium, 0.1 per cent, iron 1 per cent, silicon 2.2 per cent, titanium, 0.1 per cent; remainder commercial aluminum. Tensile strength of sand castings after artificial aging 25,000 lb. per sq. in. (minimum), Brinell hardness, 70.

R. R. 56 alloy: Another of the Rolls-Royce series, this being a forging alloy. Composition: Copper 2 per cent, nickel 1.3 per cent, magnesium 0.8 per cent, iron 1.4 per cent, silicon 0.7 per cent, titanium 0.1 per cent; remainder commercial aluminum. Tensile strength of fully heat-treated forging 60,000 lb. per sq. in. (minimum, with grain), elongation 10 per cent (minimum, with grain), Brinell hardness about 140.

Calculations for Molding in the Foundry

By HARRY W. DIETERT
Harry W. Dietert Company, Detroit, Mich.

A Series of Calculations for Determining the Area of the Choke, Pouring Time, Static Pressure, Thickness of Gate and Size of Sprue

Gating of Castings by Calculating Area of Choke

THE importance of the proper rate at which a casting is poured needs appreciation by every foundryman. Many think it is sufficient to regulate the flow of metal to prevent cold shuts on one extreme and prevent straining the molds on the other extreme. These extremes will give a casting, but they are too far apart to give the perfection demanded by the present market.

Every different rate of pouring a casting will give a casting of different quality because the cooling rate of the molten metal will be different. This variation in cooling will result in case of the slow poured casting in a hard brittle casting and in case of the fast poured, a casting with segregations and internal strains.

A great deal of care is exercised in mixing the metal. In many foundries a separate department is maintained just to perform this important process of mixing and melting. After the molten metal leaves the hands of the melter very little exactness is exercised to set the molten metal at a definite cooling rate.

Micrographs are made of the test bar to control the structure of the metal. This control is not very productive in producing castings of a definite structure unless rate of pouring casting is standardized for each class of castings, for the structure of metal depends largely upon rate of cooling. Every foundryman is a heat treater in a sense, and the sooner he discovers his basic profession, the sooner better castings will be in his possession.

Possibly a little light will be thrown on the subject if one would say that a casting should be poured at a rate or feed so as to approach a progressive set of molten metal from far end to gate side of the casting.

Method of Attack

Unfortunately, wherever one deals with exactness, a definite law must be set up. These laws or mathematical equations are not always simple. The writer trusts that even the most practical foundrymen will study the first part of this work for it will deal with the time required to pour a casting called pouring time. In the second part the metal pressure head on the gate called static pressure will be discussed. The third and last part will deal with calculating the exact size of choke required to feed a casting.

Part I. Method of Calculating the Pouring Time

The first step in developing the mathematics of gating of casting was to time the pouring time of every type of casting in six foundries. Castings ranging from small bench work to 1,000 pounds castings. Mold dimensions ranging from 6″ x 10″ molds to 6′ x 6′ molds. By plotting weight of casting against pouring time we found that a line drawn through the average of the numerous points gave a smooth curve, Fig. 1. By grouping the various thicknesses of metal stocks, curves A, B and C were obtained. These curves are called pouring time. The curves are used as follows: The predominating thickness of casting walls is ¼″ and the casting weight 100 pounds. The problem is how fast should the casting be poured. Use curve B, Fig. 1. Find weight of casting on bottom of

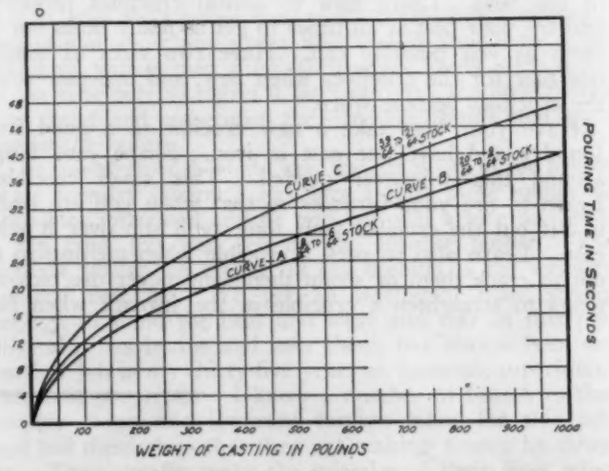


Fig. 1—Chart of Time Required for Pouring a Casting Correctly

chart. Follow the 100 line vertically until it intersects the curve B. This point corresponds to 12.5 seconds pouring time which is the proper pouring time for a 100 pound casting with ¼″ wall or stock, and poured one up.

The correct time in which a casting should be poured may also be calculated by a formula. To calculate the pouring time use the Formula A.

Pouring time in seconds equals $S/\overline{W}$.
This will be called Formula A.
Where
W—Weight of casting in pounds.
S—1.1 for a casting with 7/64″ to 9/64″ stock.
S—1.25 for a cast, with 5/16″ to 5/32″ stock.
S—1.5 for a cast. with 39/64″ to 21/64″ stock.

The calculated pouring time will check with pouring time obtained from curve Fig. 1.

This principle of gating may be applied in several ways. For example use a stop watch to obtain the pouring time of a casting. If the pouring time as found is 28 seconds for a 400 lb. casting with a stock of 5/16″ and the chart in Fig. 1 shows a pouring time 26.2 seconds, one may in-

crease the size of gate by approximation until the casting pours closely by calculated time.

Part II. Calculating Static Pressure

The rate at which molten metal will flow through a gate will depend upon the static pressure on the reduced sections of the gate called the choke or check. The static pressure will depend upon the height of a sprue and location of casting in mold. When the mold fills up with metal, the height of sprue is diminished. The effective sprue height is therefore the item in interest. The first step in calculating the area of choke is to determine the effective sprue height.

1. Determine the effective height of the sprue above the choke by using the formula (effective sprue height).

$$E.S.H. = \frac{2H \times C-(Ca)^2}{2C} \qquad \text{Formula B}$$

Where

H = Height of sprue above the choke.
C = Height of casting.
Ca = Height of casting above part.

See Fig. 2 for diagrams illustrating the application of the formula for various types of molding. All dimensions are in inches.

Part III. Calculating Area of Choke.

The area of the choke required to feed a casting properly depends upon pouring time required for proper cooling and effective sprue height.

The area in square inches of the choke may be calculated by using formula C.

$$\text{Area of choke} \quad \frac{X\sqrt{W}}{\sqrt{E.S.H.}} \qquad \text{Formula C.}$$

Where

W = Weight of casting in pounds.
E.S.H. = Effective sprue height obtained in formula B.
X = .38 for castings with 39/64″ to 21/64″ stock.
X = .32 for castings with 5/16″ to 5/32″ stock.
X = .28 for castings with 9/64″ to 7/64″ stock.

Application

A good method of applying the gating principle is to calculate the area of gate before or after the pattern is made and actually place a gate with a choke of the size as calculated by the use of formulae B and C. For example:

The casting has a stock of $\frac{3}{16}$″ and weighs 100 lbs. Will be gated at parting line as in C Fig. 2. When Ca. is 15″, C is 25″ and H is 20″.

Then

$$E.S.H. = \frac{2HxC-(Ca)^2}{2C} = \frac{2x20x25-(15)^2}{2x25} = 15.7 \text{ inches.}$$

$$\text{Area of Choke} = \frac{X\sqrt{W}}{\sqrt{E.S.H.}} = \frac{.32\sqrt{100}}{\sqrt{15.7}} = .81 \text{ Sq. In.}$$

Then actually make the cross sectional area of the choke .81 sq. in. and the pouring time will be 12.5 seconds within practical limits.

Check the pouring time of all castings in the foundry and plot results as in Fig. 1. Then draw conclusions whether castings poured off average curve gives better results than when poured so as to check with other castings that are poured on the curves. If they are poured other than regular, know why.

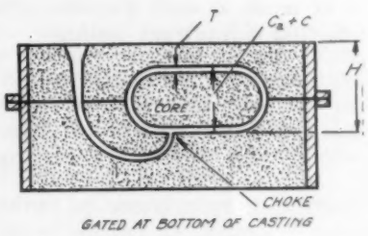
Determining the Thickness of the Gate

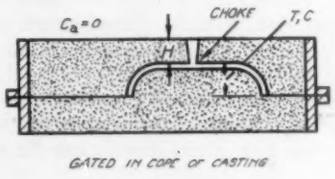
The thickness of a gate will largely determine the amount of molten metal fed through the gate to the casting. The amount of feed through the gate increases as the thickness of gate increases.

Gates that are too thick or heavy will cause the casting to be porous at the junction of gate with casting. In addition to this, the thickness of a gate should be such as to enable one to break gate off readily without gate breaking off in casting.

The thickness of a gate should be proportioned in respect to the stock thickness of the casting.

Therefore, knowing the stock thickness of the casting, one can calculate the thickness of a gate by the following formula D.





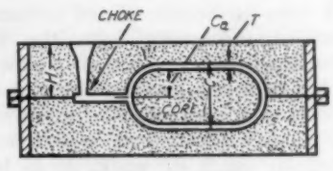


Fig. 2— Diagrams for Effective Sprue Heights

Thickness of gate = f x Casting stock thickness.

Where

f = .8 for cored grey iron castings.

For example:

Thickness of metal of a grey iron casting is ⅜″.
Thickness of gate = .8 x ⅜ = .30″.

Having calculated the area of the gate choke previously by formulae B and C one may calculate the total width of gate or gates, knowing the thickness. For example, area of gate choke required is 1.2 square inches and the thickness of gate required is .30 inches. Then the total width of choke of gate equals 1.2 square inches divided by .3 equals 4 inches wide.

Size of Sprue

A sprue of proper size is required to make it possible for gate to function properly. In a case where the choke is located in sprue, the size of sprue is fairly fixed by the area of the choke.

In cases where the choke is not located in the sprue, the size of sprue should have a fixed relation to the area of the choke, as established by the following formula E.

Area of small part of sprue = e x area of choke.

Where

e = 1.4 for grey iron.

For example:

Knowing the area of choke to be 1.2 square inch, the area of the sprue equals

1.4 x 1.2 = 1.68 square inches.

A sprue with a diameter of 1 15/32 in. will have an area of 1.68 squares inches. This will result in a sprue which will have a sufficiently low molten metal velocity to avoid carrying slag and dirt into the gate and, in addition, will be of sufficient size to retain the metal molten until after the gate has set.

While values of the various coefficients for steel and non-ferrous metals are not given, it should be known that they can be obtained by investigation without undue effort in as much as each formula is basically correct for ferrous and non-ferrous castings.

Conclusion

1—The formula A as given herein for pouring time will hold for all molten metals and various stocks of casting. The constant S should be carefully determined for individual conditions other than those agreeing with conditions mentioned in this paper.

2—The formula B for determining effective sprue height will hold for any metal.

3—The formula C for calculating the area of choke will hold for any molten metal. The constant X will have to be determined for each metal other than cast iron and stocks as listed.

4—The area of choke for each new job should be calculated to eliminate the experimental gating period and insure sound castings immediately. Many years of experimental gating have perfected your present gates in the shop. Why not express these in figures?

5—The formulas given in this paper will cover many classes of castings. However, considerable data must be collected before exact constants may be given which will cover all classes of castings and metals.

Spotting Out

By AUGUST G. HOFFMANN

Elevator Supply Company, Hoboken, N. J.

ABOUT a year ago, I was confronted with this problem on bronze plated ornamental iron castings, and after experimenting with the many known neutralizing solutions, hot and cold washes, etc., I decided to try to get to the bottom of the cause and if possible find a remedy, so I proceeded as follows:

I plated a small, very porous looking iron casting with a regular batch of work, so as to get the identical condition. After drying in sawdust, I broke this up into several pieces and put them aside for a few days, when I started to work on them.

A number of these pieces exposed the pores at the break and on examining closely, I found a grayish crystalline looking deposit, which when washed with hot distilled water produced an alkaline reaction, proving that the salts of the solution crystallize in the pores on drying.

I will not go into the fine details of my experiments, but they showed that this deposit when hot and dry was more readily absorbed by cold water than when wet. So I decided on the following procedure; to expand the pores of the metal with dry heat and contract them with cold water, as a means of expulsion of the deposit. In this fashion, during ten months of actual practice, using the following process, to prevent spotting out, I have eliminated 95 per cent of my troubles from this source.

The castings, after plating, are rinsed in cold, then hot water, and again in cold and hot water, so as to assure thorough rinsing, put into an oven, heated to 180° F. and allowed to remain long enough to absorb this temperature, after which they are plunged directly into cold running water, where they remain long enough to reach the temperature of the water, about 62° F. or less if possible.

After 3 to 5 hot and cold treatments (varying with the condition of the castings) with the final drying done in the oven, the castings are allowed to cool under atmospheric conditions, to handle for final oxidized finishes and lacquered, the lacquer being air drying.

The conclusion of my experiments was that the expansion of metal by dry heat also causes dry crystallization; therefore the contraction by cold water causes a maximum of absorption of the same. By repetition of this process the crystals are removed. The number of heat and cold treatments required depends on the condition of the castings handled.

This may seem like a lengthy process, but with proper equipment, the castings can be plunged into the cold water bath every half hour. The small cost of ordinary manual labor required for this process is but a fraction of the losses entailed by refinishing spotted articles.

Non-ferrous castings can be treated in a similar manner, if not immersed into solutions which cause a salt deposit not soluble in water to crystallize in the pores of the metal.

Deplating Aluminum

Q.—We make architectural castings of 5% silicon, 95% aluminum, and wish to treat them to darken them and prevent corrosion. The deplating process is expensive. Is there any other method?

A.—The anodic, or deplating, process is the only one we are familiar with. O. J. S.

Cold Treating Duralumin Rivets

By ROBERT JOHNSON
Boeing Airplane Company, Seattle, Wash.

How Dry Ice Is Used After Heat Treatment to Delay the Age Hardening Which Sets in Immediately After Quenching.

WHEN metals, particularly duralumin, began to be used in general in the building of airplanes, Boeing Airplane Company of Seattle, one of the largest plants of its kind in the country, found itself beset by problems concerning the handling of treated metals in airplane production. One of the thorniest problems was that of heat-treated duralumin rivets. To attain proper temper in the metal, these rivets were heat-treated in molten salt at a temperature of 950° F. and then quenched. Immediately following the heat-treating and quenching, the metal begins to harden, with the result that after a period of 15 to 30 minutes immediately following the treating process, the rivets are too hard to be used in airplane construction. Consequently it was necessary that all rivets be used only during the 15 minute period following their treating, and this necessitated the continuous operation of the duralumin heat-treating plant throughout the entire day.

Engineers of the Boeing plant conducted an experiment to determine the effectiveness of cold temperatures in protracting this age hardening of the metals. After heat-treating, dry ice was selected as the cold agent for this experiment. Sample rivets were heat-treated, quenched and immediately placed in a box cooled to a temperature of 10° F. by dry ice. After one week it was determined that the rivets had not hardened appreciably, while at the end of two weeks they had hardened only slightly.

This test demonstrated that the hardening of the metal could be delayed for reasonable lengths of time by dry ice, and the Boeing Airplane Company decided after the experiment had been successfully completed, to place this in practice in its production methods.

Boxes of plywood lined with thick layers of balsa wood were prepared to house the dry ice and rivets. Each morning the duralumin heat-treatment plant prepares the required number of rivets for the day, and these are immediately stored in the small distribution boxes, and also in a large master storage box of the same type of construction.

As the rivets are required by the riveters throughout the day, they are taken out of the dry ice boxes. A rivet which has been in the box for an entire day can be taken out and it will be found that the rivet is in exactly the same condition as it was immediately after it was heat-treated and quenched in the morning.

In consequence, the Boeing Airplane Company has found that this system is resulting in considerable saving of time and reduction of expense, and engineers foresee the application of this to all duralumin parts, not merely rivets.

They are also considering the use of an electric refrigerator for the master storage box instead of a large dry ice box which is being used at present. It is thought that the electric refrigerator will permit even more saving. The dry ice boxes will be continued for the distribution from the master storage box.

Both the newest commercial and military models produced by the Boeing Airplane Company are either all metal, or else primarily of metal construction.

The Photo Above Shows the Cold-Treating Box in Use at the Boeing Plant. At Right Is Shown a Close View of the Box, with Trays of Rivets in It.

The Fundamentals of Brass Foundry Practice

By R. R. CLARKE

Foundry Superintendent

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Work—Part 27.*

IN referring to the physical requirements of different alloys, it must be noted that the results obtained in the test specimens as well as the castings seem to vary with general experience, in using even the same grades and percentages of metal, melted and poured at different times. Some tests will exceed expectations while others will fall behind the requirement. This discrepancy is a source of puzzling concern to the foundryman. With methods and practice apparently duplicated, it is hard to understand why similarity of results does not result; why one test bar for instance will pull to 15 per cent elongation, and 30,000 lbs. tensile strength, while another will show only 6 per cent elongation and 20,000 tensile. Assuming the test bars to be solid and flawless in both cases, it can only be concluded that conditions have not been absolutely duplicated in the making of the bars. The thing does not "just happen." It is in some way or other caused to occur. In some small detail or details of practice something has varied. Like causes produce like effects and practice absolutely duplicated maintains given duplicate results. The discrepancy probably is most likely to occur in the failure to repeat exactly, conditions of practice. Everything has a bearing on the status of melted metal; the moisture, permeability, uniformity of sand, the furnace practice, the melting time, temperature, practice of protection, time and order of introducing the alloying elements, the molding practice with respect to ramming, gating, feeding, venting, pouring temperature, pouring rate, etc.; the absolute exactness of weights of the different metals making up the alloy and their constant maintenance during melting and up to pouring; the time the casting or test bar remains in the sand until shaken out, these and many other apparently insignificant details of procedure make for the slight differences in results. Only scientific measurement can be trusted; measurement for instance of the permeability, moisture and density of sand, the running and feeding capacities of the gates, the melting and pouring temperatures, the cooling rate of the casting as affected by the hardness and density of the mold, etc. These and other features must be the subject of scientific measurement if exact uniformity of results is to be expected.

With respect to the general principles of practice conducive to higher physical properties of test bars and castings, it must be remembered that in certain details there must be variations for different compositions of alloys. The well known 88 copper, 10 tin, 2 zinc alloy is representative of the tin bronzes and can be used as an example in noting the practice under which its best properties will be obtained.

1. The component metals should be high grade.
2. The raw metals should be melted, alloyed and ingoted. Then remelted and poured into castings from the ingot.
3. If gates are used to make up the heat, use 80 per cent gates, balance new metal, and pour on first melting. If the gates are from the third or fourth remelting use only 60 per cent gates.
4. Add from ½ to 1 per cent zinc more than the 2 per cent called for to compensate for zinc loss.
5. Use about ¼ oz. of 15 per cent phosphor copper to the 100 lbs. of metal to deoxidize the melt.
6. Melt under charcoal covering to 2120° F.
7. Pour castings at about 2085° F.
8. Use medium open sand on the dry side.

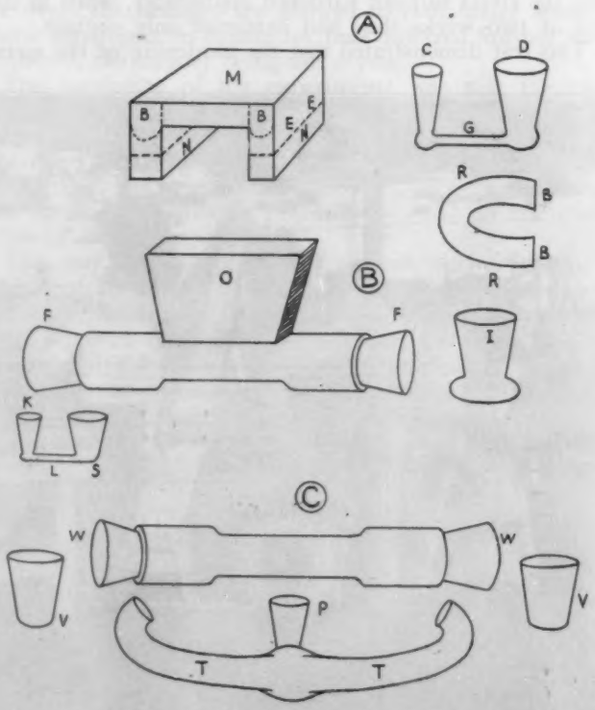


Fig. 80. Methods of Gating and Feeding Test Bars

* All rights reserved. This series will be collected and published in book form. Parts 1 to 26 inclusive were published in our issue of July, August, September, October and November, 1926; January, February, March, April, May, August, September, November and December, 1927; March, May, August, September and December, 1928; March, April and October, 1929; May, August and October, 1930, and July, 1931.

9. Mold the bar under ample cope height, 5 to 6 inches.

10. Skim the metal by a skim gate, scrupulously clean, into the mold.

11. Feed the casting or the bar liberally.

12. Leave castings or bar in sand until cold before removing them.

Test bars of the type known as the "Government Bar," made by this practice from this alloy have given as high as 22 per cent elongation, 36,000 lbs. tensile strength and Brinnel hardness up to 75. The method of gating and feeding this bar on this occasion is shown in Fig. 80 along with other types of bars sometimes used. In this drawing, A is the Government Bar, the bar being sawed off the lower edges of the casting leg as indicated by the dotted line EE. It is then turned to dimensions and tested. The advantage of this bar as claimed, is the heavy and full feeding that the bar section derives from the heavy metal section above it and the cleanliness of metal by the time the machine tool reduces the section to bar shape and dimensions. Sketch A is the test bar casting, N-N the bar section. BB are the gating points from which heavy gates RR go back to the heavy feeding riser, DC is the pouring sprue and G the thin gate section connecting with the heavy gate R and delivering clean skimmed metal to them and the casting. The mold is made of green sand on the dry side except for the channel core which is dry sand. The cope height is 6 inches and the metal poured at 2085° F.

Sketches B and C are representative of different methods of gating and feeding the old standard test bar. In B, K is the pouring, L the skimming and I and S, feeding risers of the gates, while O is the wedge shaper riser to feed the middle section. In sketch C, metal is poured at gate P, skimmed through TT into end gates WW underlying risers VV.

Incidentally, these B and C bar molds are often made in dry sand cores rammed up in green sand molds or in all dry molds. These gates and risers are all set gates of uniform and constant shape and calculated dimensions. They are not cut in the sand by the molder. This is to insure uniformity of gates that will give duplicating results.

The molding and gating practice of other alloys for test is approximately the same throughout; likewise the furnace practice, excepting the maximum metal temperature in the furnace and at pouring. These, as everyone knows, cannot be the same in all alloys of different make-up. The safe practice is to determine the best temperature for each by trial and then to duplicate it by the use of a pyrometer.

This series will be continued in an early issue.—Ed.

American Chemical Society Meeting

Papers Read on Metals and Metal Coatings

BETTER protective coatings for use in automotive, marine, aircraft and railway manufacture were urged at the eighty-second meeting of the American Chemical Society, which attracted 2,000 scientists to Buffalo, N. Y., during the week beginning August 31. A symposium on "Industrial Coatings from the Consumer's Viewpoint" was held on Wednesday morning, September 2. The need of chemical research was stressed.

Improvements in automobile finishes discussed by General Motors representatives included a rust-resistant fender enamel, lacquer with better chalk-resisting properties, and increased resistance to chipping from stones thrown up by the tires.

"The greatest portion of present-day airplane structures," J. L. McCloud, of the Ford Motor Company, pointed out, "is of light metal alloys, and these are prone to corrosion of the intercrystalline type. Such corrosion lowers the elongation obtained in tensile test specimens and makes what we call a more brittle condition."

Arthur Schuh, of the Bell Telephone Laboratories, in a summary of his paper on "Evaluating Industrial Finishes," asserted "the thousands of different parts employed by the telephone industry require a great variety of finishes designed for protective, decorative, or insulating purposes.

"Newly developed methods of evaluation consist of subjecting coatings of uniform thicknesses to controlled environments, and periodically measuring changes in physical properties which take place. While the method is being used primarily as a means of selecting materials for finishes, it should prove to be of value to the manufacturer and research chemist in the paint industry."

Corrosion of Metals by Milk. The Effects of Operating Conditions on Corrosion in Various Parts of Pasteurizing Equipment, by H. A. Trebler, W. A. Wesley and F. L. LaQue.

Corrosion of nickel by sweet milk was studied in detail by both plant and laboratory tests. Tests were made on copper, nickel silver, a chromium-nickel and chromium-nickel-iron alloy.

Nickel exposed to milk being heated was protected by a protein film. Film formation was favored by air supersaturation and high velocity. Corrosion was rapid in cooling milk, depending on aeration, temperature and velocity. Copper in milk had a negligible effect. Galvanic corrosion due to differences in metal, aeration or temperature was unimportant.

Copper was not protected on heating, nickel silver slightly.

The chromium-nickel-iron alloy was resistant in the limited number of tests in which it was included.

Correction

On page 285 of our July, 1931, issue was given a list of all the papers read at the recent meeting of The American Electroplaters' Society. Number 11 on that list was given as, "Barrel Plating with Zinc Cadmium Alloy, by L. W. Stout of Washington University." This should have read, Barrel Plating with Zinc Cadmium Alloy, by L. E. Stout and I. Kowarsky of Washington University, etc.

Electrochemical Society Meeting

Abstracts of Papers Read at the Sixtieth General Meeting Held in Salt Lake City, Utah, September 2 to 5, 1931.

CYANIDES IN METALLURGY

By M. R. Thompson

A review is given of the status of the production and metallurgical uses of cyanides, showing that thousands of tons of this commodity are used annually in the electroplating of metals, the extraction of gold and silver from ores, and the case hardening of ferrous materials. The advantages and disadvantages of cyanides are discussed in detail. Some problems are mentioned on which research is needed. The data given refer in particular to the United States.

ELECTRODEPOSITION OF IRON, COPPER AND NICKEL ALLOYS FROM CYANIDE SOLUTIONS—PART I

By Lawrence E. Stout and Charles L. Faust

Data on the deposition of alloys of copper, nickel and iron from cyanide solutions containing potassium tartrate, indicate that ternary alloys may be deposited in good physical form. The deposition of copper is favored over that of the other two metals, especially at low current densities. Difficulties are encountered in handling the baths due to the formation of, and the precipitations at the electrodes of, cupric and ferric ferrocyanides. Increase in bath temperatures minimizes these troubles. Extended theoretical discussion on the findings of this research will appear in a subsequent paper.

THE PASSIVITY PRODUCED BY CHROMIC ACID ON 18-8 CHROMIUM-NICKEL ALLOY

By Colin G. Fink and F. J. Kenny

A comparison of the corrosion resistance toward ferric chloride solution, calcium chloride solution and sodium chloride salt spray of untreated metal and metal anodically treated in chromic acid showed that anodic treatment greatly increases the corrosion resistance. It was observed that the local action on areas which had been subjected to cutting and punching stresses could be avoided by anodic treatment of this material. A comparison of the corrosion resistance toward ferric chloride solution of samples of the untreated metal, samples treated in chromic acid without the use of electric current and samples treated anodically in chromic acid showed that the anodic treatment produced a greater increase in corrosion resistance than treatment without electric current and that the untreated samples and samples treated without electric current corroded to a large extent by local action, whereas the anodically treated samples underwent uniform general corrosion over the entire surface, but much less in degree and generally without pitting.

It was shown that during anodic treatment there was produced a decided loss of weight, whereas treatment without the use of electric current produced practically no loss in weight and also that the anodic treatment loss increased as the temperature was increased above 25° C. It was shown that an increase in anodic treatment loss was accompanied by a decrease in subsequent corrosion loss.

Since microscopic examination showed that cross sections of the alloy have practically the same structures throughout, the improvement in corrosion resistance produced by anodic treatment cannot be accounted for on the grounds that the surface of the metal was of a more easily corrodible structure than the interior of the sheet, and that the removal of the surface by anodic treatment left exposed the more corrosion resistant interior. Since it was shown that anodic treatment greatly increased the corrosion resistance of unpolished samples the increase in the corrosion resistance of anodically treated polished samples cannot be accounted for entirely on the grounds that the surface film produced by polishing has been removed in anodic treatment.

When potential measurements were carried out by means of a small capillary at various points on the surface of anodically treated and untreated samples which had previously been subjected to a treatment to free them from oxygen, it was found that the treated samples showed a more uniform potential than the untreated samples.

The above observations point to the belief that anodic treatment tends to equipotentialize the surface by selectively dissolving the more anodic areas, thereby leaving the more cathodic areas to be coated with oxide. The final result is to form an oxide film over the entire surface of the sample, which has been, to some extent, equipotentialized. Such a surface should be more resistant to corrosion than one consisting of an oxide coating over a surface of non-uniform potential, for once the oxide coating is removed in subsequent corrosion the equipotentialized surface should present much less opportunity for local action and general corrosion than the other.

The passivity produced by anodic treatment in chromic acid of 18 per cent chromium, 8 per cent nickel alloy is brought about by (1) the equipotentialization of the surface and (2) the coating of the surface with an oxide film.

THE STABILITY OF CADMIUM CYANIDE PLATING SOLUTIONS

By S. Wernick

The desirable properties of a cadmium deposit obtained from a cadmium cyanide plating solution are largely dependent on the composition of the solution and the

conditions of deposition. These properties affect the degree of protection which cadmium affords to ferrous metals and therefore it is desirable to standardize the optimum composition of the electrolyte and operating conditions to produce uniformly the best type of deposit. The cadmium solution, however, tends to change in composition due to the electrode efficiency ratio (ratio of anode to cathode efficiency) being often considerably in excess of unity. The present paper examines the effect of variation in concentration of cadmium, free cyanide, caustic alkali, current density, and temperature on the value of the electrode efficiency ratio, the conductance of the solution, and the character of the deposit obtained.

ON THE EFFECT OF MERCURY IN ZINC CYANIDE PLATING SOLUTIONS

By M. deKay Thompson and W. E. Charles

The hydrogen overvoltages on various kinds of iron and on electrodeposited zinc and on zinc-mercury are determined at 35° C. in alkaline cyanide solutions; also the current density-electrode potentials of zinc in alkaline zinc cyanide and of zinc-mercury in alkaline zinc cyanide and mercury cyanide. The beneficial effect of mercury in zinc solutions for plating zinc on iron is explained from these results and the known fact that mercury is the most electro-positive of all the cations in the plating solution.

ELECTROPLATING ON ALUMINUM FROM CYANIDE SOLUTIONS

By Harold K. Work

The general field of electroplating on aluminum from cyanide solutions is discussed. A distinction is made between the application of the electroplate directly on the aluminum and the application of the electroplate over a preliminary nickel layer. Particular emphasis is given to the electroplating of zinc on aluminum, especially with reference to the corrosion resistance of the coated aluminum.

CYANIDES IN RELATION TO SILVER AND GOLD SOLUTIONS

By E. J. Dobbs

Silver plating solutions compounded with potassium cyanide work more smoothly and easily than silver solutions compounded with sodium cyanide. The structure of the silver deposit is better; a higher current density without burning is possible; and the throwing power is higher. In the case of gliding solutions, KCN again has advantages over NaCN. It allows of a greater margin in the plating range without spoiling the color. In England KCN is used almost exclusively.

THE DEFINITION AND DETERMINATION OF "FREE CYANIDE" IN ELECTROPLATING SOLUTIONS

By W. Blum

The usual definition and determination of "free cyanide" involve uncertainty in some plating solutions. The following definition based on the ability to dissolve metal compounds is proposed: "The free cyanide in an electrodepositing solution is the excess of alkali cyanide above the minimum required to give a clear solution." Methods of determining cyanide in a plating bath are discussed. One purpose of this paper is to obtain comments for the committee of the American Standards Association.

HYDROGEN AND OXYGEN OVERVOLTAGES ON NICKEL-IRON ALLOYS

By M. deKay Thompson and Albert L. Kaye

The oxygen and the hydrogen overvoltages of the iron-nickel series of alloys were measured in molar potassium hydrate at 25° C. The hydrogen overvoltages of pure nickel and pure iron in hydrate are considerably lower than in acid. One set of constants in the formula $\eta = a + b \log i$ applies to the whole range of current densities for the hydrogen overvoltages; two would be required for the oxygen.

Standards for Zinc-Coated (Galvanized) Sheets

The American Standards Association has just approved American Tentative Standard specifications for zinc-coated (galvanized) sheets of Bessemer steel, open-hearth steel, and open-hearth iron. Five classes of zinc coatings, applied by the hot-dip process are covered in the specifications, as follows:

Class A—Extra heavily coated sheets that are not intended to be formed other than by corrugating.

Class B—Heavily coated sheets that are not intended to be formed other than by corrugating and curving to large radii.

Class C—Moderately heavily coated sheets for moderate bending.

Class D—Ordinarily coated sheets for general utility.

Class E—Sheets having lighter, more tightly adherent coatings to reduce liability of flaking in severe forming.

Class D coatings approximate those of Class C except in medium gages in which coatings of Class D are appreciably lighter. Class D represents material generally available in warehouse stocks which is not intended for use where relatively long life, represented by Classes A, B, and C, or severe forming (Class E) is required.

The standard includes sections dealing with chemical properties and tests, physical properties and tests, base metal tests, coating tests, permissible variations, finish, marking, and inspection and rejection. Provisions for minimum requirements when copper is used in the base metal, requirements for weight of the zinc coating including a table of weight of coatings by ounces per square foot, provisions for base metal tests, coating tests, and weight tests, and a table showing gage range and permissible tolerances in weights of sheets in percentage of theoretical weight are included in the standard.

The standard was submitted to the American Standards Association by the American Society for Testing Materials, sponsor for the project.

J. A. Capp, General Electric Company, New York City, is chairman of the sectional committee on Specifications for Zinc Coating of Iron and Steel; and A. B. Campbell, National Electric Light Association, New York City, is secretary.

Copies of the standard may be obtained from the American Standards Association, 29 West 39th Street, New York City, at 25 cents each.

Metal Polishing by Flexible Polishing Wheels

By EDWIN M. BAKER and GEORGE E. HOLBROOK

Associate Professor of Chemical Engineering, and Member of the Department of Chemical Engineering, Respectively, University of Michigan, Ann Arbor, Mich.

Apparatus Which Was Designed and Built at the University of Michigan for Experimental Study of Metal Polishing by Flexible Polishing Wheels—General Procedure of Laboratory Tests, and Experimental Data Which Were Obtained — Part 2, Conclusion*

A PAPER PRESENTED AT THE FIFTY-NINTH GENERAL MEETING OF THE ELECTROCHEMICAL SOCIETY HELD AT BIRMINGHAM, ALA., APRIL 23, 24 AND 25, 1931.

REFERENCE has been made to application of glue to surface of wheel after it was completely set up, or the practice of "top dressing." In Fig. 8 there is shown the relation between the concentration of glue in the top dressing and the efficiency and the cutting speed obtained with wheels set up with No. 46 grain.

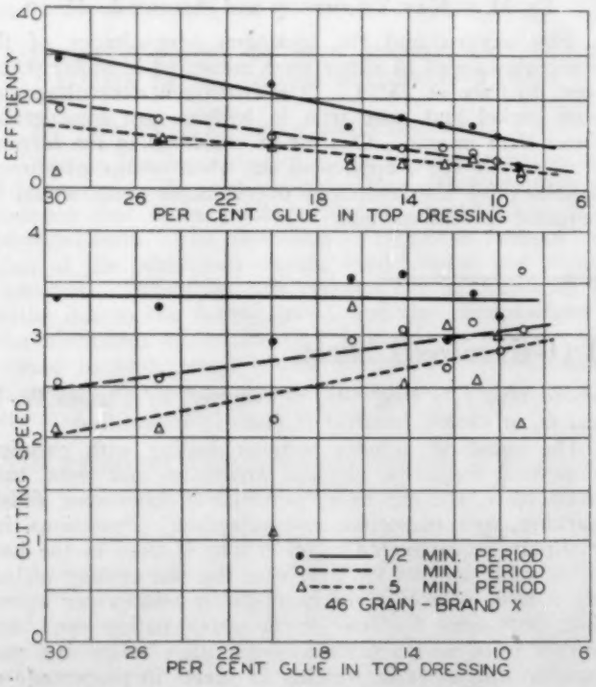


Fig. 8. Relation Between Glue Concentration of Top Dressing and Efficiency and Between Glue Concentration of Top Dressing and Cutting Speed—46 Grain. Cutting Speed in Grams of Steel Per Minute Per Cm. Width of Cut. Efficiency in Grams of Steel Per Gram of Wheel Wear.

It will be noted that the more concentrated glue gives increased efficiency. The efficiency is three times as great with 30 per cent glue in the top dressing as it is with 10 per cent glue. The more concentrated glue does result in decreased cutting speed, particularly during the later parts of the wheel life. The decrease in cutting speed is, however, over-balanced by the increased efficiency resulting from the use of more concentrated glue in the top-dressing.

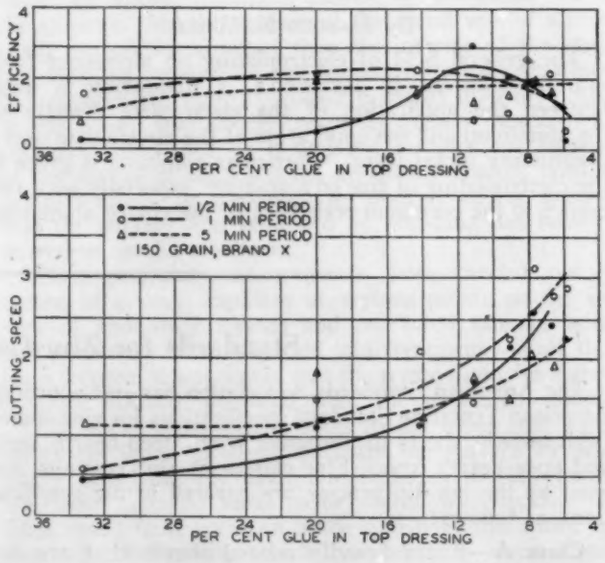


Fig. 9. Relation Between Glue Concentration of Top Dressing and Efficiency and Between Glue Concentration and Cutting Speed —150 Grain. Cutting Speed in Grams of Steel Per Minute Per Cm. Width of Cut. Efficiency in Grams of Steel Per Gram of Wheel Wear.

Corresponding data for wheels set up with No. 150 grain are shown in Fig. 9. It will be noted that the efficiency is decreased rather than increased when increasing concentrations of glue are used for top dressing wheels set up with this fine abrasive. The cutting speed is also materially decreased. From these and many similar data, which are not presented here, we have arrived at the

* Part 1 appeared in the issue of August, 1931, page 346.

conclusion that top dressing is well worth while for wheels set up with 100 grain or coarser grains, but that it is disadvantageous rather than advantageous on the finer grain sizes.

SUMMARY

The experimental machine and method described have been of value in this preliminary study of metal polishing. This method of study has also been of value in comparing different glues as well as various polishing abrasives. That it is a useful tool for the rapid survey of polishing problems follows from a summary of these data which have been substantiated in large scale commercial polishing operations.

Effect of Variations in Pressure Upon Performance

Coarse Grain. (No. 46.) (a) Doubling the pressure between the steel being polished and the wheel increases the cutting speed and will approximately double the quantity of steel polished away per minute. (b) Increasing the pressure decreases the efficiency except at low pressures. The apparent optimum pressure is in the region of 0.5 to 1 kg. per cm. width of wheel. At higher pressures doubling the pressure will approximately quadruple the wheel wear per gram of steel polished away. For example, one-fourth as many pieces would be polished per wheel.

Fine Grain. (No. 150.) (a) Increase of pressure above 0.5 kg. per cm. width of wheel has little effect on the cutting wheel. For lower pressures the cutting speed is roughly proportional to the pressure, much the same as in the case of coarse grains. (b) Increase of pressure results in only slight increase of wheel wear or only slightly decreases the number of pieces polished per wheel.

Effect of Closeness of Grain Sizing Upon Performance

Closely or accurately sized grain gives about the same cutting speed as loosely sized grain. However closely sized grain is much more efficient, and in the experimental apparatus as much as two and one-half times as much steel was polished away per gram of closely sized grain as could be polished away per gram of loosely sized grain. The closely sized grain bought on a special specification is about one-third more efficient than the grain furnished on the usual specification. It also cuts faster.

Effect of Wheel Wear on Performance

A study of the wheels as they are worn down confirms the usual observation that the speed of cutting decreases with wheel wear. No definite conclusion can be drawn regarding the change of efficiency with wheel wear. However, the use of more concentrated glue solutions in setting up the wheels is favorable to the maintenance of wheel efficiency.

Effect of Top-Dressings Upon Performance

Coarse Grain. (No. 40.) Wheel wear is decreased, and therefore wheel life and efficiency are increased for the coarser sizes of grain by the application of a thin coat of glue to the surface of the wheel after it has been set up. Increase in the concentration of the glue used for the top-dressing greatly increases the wheel efficiency, and is accompanied by only moderate decrease in cutting speed.

Fine Grain. (No. 150.) No benefit is gained by this procedure in fine sizes of grain, since efficiency is not increased and cutting speed is greatly decreased.

CONCLUSION

More precise results than those here reported can probably be obtained by using full-sized commercial polishing wheels with an experimental equipment similar to that here described, in that all the variables entering into the problem may also be carefully controlled. The use of full-sized wheels would eliminate any question of the direct applicability of the experimental results to practice. Such a research has been initiated by one manufacturer of abrasives, who is conducting an ambitious study of metal polishing with flexible wheels. However, data obtained with this small apparatus have been useful, and have resulted in improved wheel performance in a number of plants.

The authors express their thanks to the General Spring Bumper Corporation, at whose instance the work here presented was performed, for permission to publish this material.

Evening Course in Electroplating

A NEW CLASS in practical electroplating at the College of the City of New York starts on September 28, 1931, under the personal direction of Dr. L. C. Pan. It is open to all persons interested in electroplating, metal finishing and chemical control of plating solutions. The class will meet on Mondays and Wednesdays from 7 p. m. to 11 p. m. in the Chemistry Building, Amsterdam Avenue at 139th Street, New York City.

The subjects covered by the course are as follows:

1. Fundamental principles underlying the various operations of modern electroplating.
2. A critical study of present-day practice in electroplating of various metals and alloys, including copper, nickel, chromium, cadmium, zinc, brass, iron, lead, tin, silver, gold, platinum and rhodium.
3. Physical and chemical methods of control, including simplified methods of analysis and preparation of standard reagents.

Laboratory work constitutes an important part of the course. Among the exercises to be done in the laboratory are the Faraday's law, current efficiency, determining thickness of deposit, electrode potentials, polarization and depolarizers, metal, metalion and hydrogen-ion concentrations, buffers, brighteners, throwing power, porosity and corrosion tests, and analysis of plating solutions. The laboratory work is arranged flexibly so as to meet the individual needs of each student.

Registration may now be made evenings in person or by mailing a check or money order for $37.50 payable to the College of the City of New York, attention of Evening Session, Room 100, Main Building, 140th Street and Convent Avenue, New York City.

Electroplating on Cold Rolled Steel

By GEORGE B. HOGABOOM

Electroplating Engineer, Hanson-Van Winkle-Munning Company, Matawan, N. J., and Associate Editor of THE METAL INDUSTRY

How the Quality of the Base Metal Affects Plating and Polishing Operations.

A PAPER READ AT THE 19TH ANNUAL CONVENTION OF THE AMERICAN ELECTROPLATERS SOCIETY IN ROCHESTER, N. Y., JUNE 30-JULY 2, 1931, AND PUBLISHED IN THE MONTHLY REVIEW FOR AUGUST, 1931.

SEVERAL inquiries were received regarding the plating of cold rolled steel. In laying out cycles for full automatic plating machines we have been up against it on some classes of cold rolled steel; and that has demanded an investigation. We had certain theories, and basing these upon points that were brought out by some authors led us to believe that it would be well if the platers could understand exactly the condition of the steel they are to plate. We see a piece of cold rolled steel, and get a picture, but know nothing about the process through which it passed, or the effect that the process had upon the forming, the polishing or the plating of it.

The process of manufacturing cold rolled steel has changed. It had been common practice, in nearly all the cold rolled steel that was supplied a few years ago, to pack roll it. That is, one sheet was bent over another, and then, after it was rolled, was bent over upon itself, and several layers of metal were rolled one on top of the other. That gave a different surface condition to the steel than is had in the present method, which is used quite extensively, of strip rolling, where the metal is rolled in strips, in gang rolls, passing it from one to the other, or in rolls one above the other, some of them as much as four high.

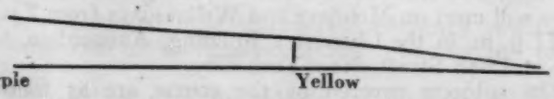
It was the practice several years ago to hot roll to a certain gauge, anneal at a definite temperature, pickling and then, after the required number of passes to anneal in a closed retort to prevent oxidation. When that metal was finished, it had a uniform structure. The grain size was approximately the same throughout the whole sheet. That gave an excellent metal upon which to deposit any metal. We have found that today metal is hot rolled to almost the required gauge, pickled, and then given one pass through the cold rolls. That gives a skin of cold worked metal which is very difficult to detect under a microscope. We have looked at some steel that had been pack rolled and some strip rolled, and could not determine the difference. It isn't perceptible unless you use very high magnification and examine the cross-section.

This stock is what is giving the most trouble. It can be purchased at a lower price than pack rolled or even strip rolled metal. There is large crystal structure inside and a fine distorted crystal structure on the surface. When such metal is formed in presses oftentimes the surface breaks and then you have the hot rolled structure exposed through the cracks. We have seen articles made from this stock that were required to be heated after they were nickel plated, with the result that while the adherence was perfect innumerable fine blisters appeared all over the surface. Break those blisters and under you find the hot rolled structure. Oxide and slag inclusions prevent good adhesion.

I spoke at a meeting last May and an enamel man exhibited a piece of japanned stock. He stated that he could not explain the cause of the trouble and he had taken it up with the steel people and they could offer no explanation. The probable cause was that this stock had a cold rolled surface. The piece looked as if pieces of lint had fallen on the surface of it. When the japan was removed, the surface cracks in the steel could be seen and these were identical with the "lint" marks on the japanned surface. When the japan was baked at a high temperature there may have been a difference in expansion throughout the sheet, and the hard skin caused by the surface cold rolling expanded. It is probable that the ingredients used in the manufacture of japan affected the cold worked strains in the surface as mercury does strains in high brass stock. This would make an interesting problem for a steel metallurgist.

We know that if a metal is worked there may be an amorphous or a non-crystalline structure just on the surface.[1] Remember the work of Beilby,[2] who took a piece of antimonial lead, scratched it, and polished it with a piece of soft leather. The metal flowed over the scratch and covered it. He then etched the surface with a weak cyanide solution and removed the slight film of amorphous metal and revealed that the scratch had not been removed —the metal had just flowed over the scratch and hidden it.

We have also found that in drawing operations there is a heat friction and that heat friction causes not only the flowing of the metal on the surface so as to give an amorphous condition but that it also produces an invisible oxide film. I referred to that in a discussion of one of the papers at the Detroit Convention.[3] Dr. U. R. Evans of England brought that out in his lecture before the Institute of Metals in 1929. He stated that if a flat piece of steel was heated at one end that you would have a series of colors from purple to a yellow.



In the diagram the purple is at the left and the yellow should be at the extreme right. The difference in color is caused by a difference in thickness of the oxide film. It

[1] Principles of Electroplating and Electroforming, by Blum and Hogaboom (1930) p. 11.
[2] Metals and Metallic Compounds, by U. R. Evans, Vol. 1, p. 172.
[3] Proceedings, American Electroplaters' Society, Detroit Convention, 1929.

would be reasonable to assume that where the yellow stopped marked the end of the oxide coating. Evans found, however, that there was an invisible oxide film for a considerable distance from the end of the yellow. To prove this he made a molar solution of copper nitrate and applied it to this section of the steel. The invisible oxide film resisted the precipitation of the copper for several seconds. We have examined steel that has had this invisible oxide film that resisted the action of the copper solution for six minutes. In this test the copper nitrate was removed with blotting paper at the end of each minute. Evans to further prove his point put the steel in an iodide solution and obtained the characteristic curls of iron oxide.

It is reasonable to assume that if a piece of stock is hot rolled and then run through a high pressure burnishing roll to obtain a cold rolled surface condition that this invisible oxide film will be formed. When this stock is pickled a dust forms and this in my opinion has erroneously been called carbon. It will be found that the carbon percentage of this dust is very small. It contains more oxide of iron.

That presents, briefly, a picture of the steel stock which the platers are called upon to use. I talked with one of our well known members a short time ago and he told me that steel stock which is purchased for a paint job is used for plating and that he does not have the same success that he had a few years ago when they were using regular cold rolled stock. He has promised to take part in this discussion.

I talked and had some correspondence with Dr. H. W. Gillett, Director of Battelle Memorial Institute that was established to study problems of steel, and he promised that if sufficient data is obtained so as to give an indication that the problem is a serious one with the Electroplating Industry he will endeavor to find some means of studying it. It is my opinion that this is a serious condition and that is why this is brought before your attention this morning. We know that the condition exists but we cannot place our finger upon the exact cause. I have given you some of the probable causes and trust that the discussion will confirm some of these. I do know that considerable trouble is being had at the present time in plating some classes of cold rolled stock. This trouble was not experienced until the new method of manufacturing cold rolled stock was developed. If the stock has been hot rolled and then given a cold rolled surface and it is pickled long enough so as to get a good bond, you will obtain a coarse surface that will destroy the finish or rather decrease the quality of the finish that is desired, especially if the work is to be nickel plated, highly colored and chromium plated.

Discussion

Chairman Gilbertson: Now for a few minutes of brief discussion. Are there any questions?

Walter Fraine*: Speaking of the electroplating of sheet steel, especially the cheaper grades of sheet steel, we find it decidedly different from what it was some years ago. Steel at the present time is marketed at extremely low prices. And in order to do that, certain things must be done in the manufacture of that steel to bring the costs down so that they can put it on the market at low prices. In doing that, some of the operations that were formerly used have been eliminated, with the result that for ordinary purposes they have furnished a steel which is highly satisfactory, but when you come to put it through the polishing operations and plating, we find a considerable difference between the steel, especially on what we call furniture steel, as now furnished, and the steel that we had some years ago.

With us, the problem takes two phases. We finished this steel primarily (that is what we bought it for) for the enameled finishes on our register cabinets. In handling that the enameling department puts on two priming coats, and then on top of that they put a graining coat and two to three lacquer coats. Now, in the operations of handling after the pieces go into the enameling room, after the ground coats are on, they are sanded down to get a smooth surface. And they were greatly troubled by finding what they called "high spots" on the steel, and they couldn't eliminate them. They would bob up, and in order to get rid of them they would have to send many of these parts back into the polishing department to have a roughing cut put on that particular spot, in order to reduce that high spot down to the level of the surrounding surface. And it wasn't until we turned over to the chromium plating of many of these cabinets that we found out what was wrong with that steel. When we came to plate these cabinets, we found that in sending them through the ordinary hot cleaning solutions, and if we copper plated them, using a warm solution, we found that our plate blistered. When we came to investigate these blisters we found they were apparently solid; they weren't like the ordinary blister that comes up in plating, where you can lift it off and find a smooth surface underneath. But when you broke through the copper, you found the steel actually raised. In order to determine whether that was actually a steel blister or a plating blister, we went to the extent of stripping the copper off, so as to show the surface of the steel underneath, and we found these little blisters. Sometimes there would be only one or two, and sometimes there would be a network of them coming up on the surface. And due to the heat of your solution in cleaning and plating, these blisters developed.

Now the only explanation is that in the course of the rolling of your steel little pits are covered over with fresh metal, forming inclusions of air and slag which remain in the steel. Anyway, it leaves an air pocket under the surface, and the heat of the solution simply expands that pocket, and you have a small blister raised, which causes your trouble.

We have had that up with the steelmakers for a long time, and they say they can eliminate it, but the extra cost of the steel due to the extra operations they will have to put it through, to bring it to the quality that we want, is such that it really puts it outside of our needs; we can't afford to pay the price that they want for it. And the reason that it would cost us so much to have that done is because in general, for the purpose for which this metal is used, the metal is plenty good enough; it doesn't cause them any trouble. But when we get into the plating proposition, we do have that trouble, and we know that on examination of these blisters, when we open them up, we find slag underneath them in some cases, in other cases it is merely an air pocket. And there isn't enough demand on the part of industry for a better quality of steel, or enough of a better quality of steel to justify the extra expense that the steelmakers would have to go to in bringing out a better grade of steel for the purpose. If you have to get into the handling of such a steel as furniture steel, and have to put it through polishing and plating operations and you get into this trouble, you can realize that it is not a trouble that is incident to the plating and polishing operations, but it is inherent in the product itself, and is brought out by the heating of the work. Either it will do it on the polishing wheel or buffing wheel, or it will do it in your cleaning solutions. There is apparently no remedy for it except by securing a better rolled stock,

* National Cash Register Company, Dayton, Ohio.

which would mean that they would have to put back into the sequence of operations of producing the steel some of the things that they have taken out in order to secure a product that can be put on the market at as low a price as steels are selling for today.

George B. Hogaboom: I think that one of the difficulties is that the user of steel hasn't realized this phase of the problem. He thinks that steel is steel, and he can use it for all purposes. But it is my opinion that if the manufacturers realize the extra cost of these losses, and troubles, that they will soon be willing to pay the price so that steel that will give good results can be had.

C. Van Derau*: This problem of steel that Mr. Hogaboom has tried to bring out is one of the problems we have to live with every day. Many of the steel suppliers don't realize the cost of polishing steel. Even though it is possible to polish out a lot of these pits, rolled-in scale, pips, and so on, as they are called, many times you will find that an operation that could be done for half a cent will cost you five or six cents to put on the extra polishing operation.

About six years ago, we had eight carloads of steel tied up on our switch that our inspection department rejected. We have a simple method of inspection by which we take a few sheets, a sheet out of each box of cold rolled, and put it over a planer polisher to see whether it opens up. If it opens up we tie the shipment up and bring the supplier in. I will give you the cost of repairing and bringing that steel up to standard. Take an electric iron cover, for instance. It weighs approximately one pound. The steel at that time was worth about six cents a pound. The extra polishing operation necessary to take out the pips and pits and this rolled-in scale amounted to nine cents. Well, the American Steel & Wire Company said, "Go ahead and put on the extra operation and bill us back." Well, when we brought them down and they found that the extra operation was going to cost nine cents to bring that steel up to shape to save six cents worth of steel, it would have been cheaper to throw the steel out and take a total loss, rather than spending nine cents to save six.

That is pretty much what we get into with cold rolled steel, and with any steel for polishing and plating nickel, chromium, and so on. There is a lot can be done by working with the steel companies. Our steel problems have been lessened a great deal after quite a number of years. We find one of the best policies to follow is to tie up to as few sources of supply in steel as possible. Mr. Fraine brought out that this cutting of corners has taken something away from the steel that we used to have. Let's look into that picture and see why.

I think almost everyone knows today that the American Rolling Mills practically control the steel market in cold rolled metals, or even in the hot rolled metals. They have put in several installations, and an installation costs them ten million dollars to put in, a full continuous one that rolls out sheets 125 feet in length. It is almost unbelievable the speed they roll this sheet steel out, taking it from their open hearths and on through. I had the pleasure of following through some of the billets a few months ago, and I thought I was going to trail this billet through this mammoth machine and furnace set-up. The billet came out of the open hearth and in just a snap of the fingers it was a 125-foot sheet of steel rolled up, and the crane had it picked up and was moving it into stock. That is how fast they can bring it through. I asked Mr. Stringham, the vice-president in charge of operations at the American Rolling Mills, how much money continuous rolling saved. It amounts to $12.00 a ton. Now, $12.00 a ton in steel is a real factor; it is the difference between profit and loss. The other steel rolling companies that have not gone in for continuous mills are faced with the greatest problem in their history. We have one in our town that was a going concern until a couple of years ago, and they are operating now at the direction of the court, trying to salvage whatever can be salvaged. They have a very fine rolling mill, as far as the regular method of rolling is concerned.

Now, one of the things you get into that causes most of these pips and pits, is back at the open hearth at the time they make the billets. When they make a billet, they tap one of their furnaces and they pour the billet. The billet will be, let's say, eight feet long, eight to ten inches in thickness and anywhere from six to twenty inches in width. They pour that out, and the gases rise in there and keep coming up to the top. Now, to purify that billet, they generally drop in a little aluminum. Aluminum has a purifying action on molten steel, in bringing all the gases to the top. It is not very much—a handful of these aluminum slugs are dropped in, and you can see the gas roll. Then the steel company, to get away from these impurities, have to crop the end of the billet, remelt that metal and keep purifying throughout their melting process, so that it is not rolled in.

In this cropping operation, say it is necessary on an eight-foot billet to crop ten inches or twelve inches off, and they crop eight inches. It means that when the sheet is rolled, as this billet is rolled down, worked down to whatever size stock you are buying, there may be a little bit of a gas bubble or just a small particle of scale. When they roll that out in a sheet, that bubble is stretched out, and some of them may run the entire length of the sheet, or it may look like a place that the metal is actually broken.

Many times, when you get a lot of this gas, you get sheets of steel that will blister up, particularly when you put heat on them. You will find all kinds of corrosion and rolled-in material that is apparently in between two sheets of steel. That started back here with a little bit of impurity in the way of gas or in the way of dirt which becomes scale in that process.

Now, another difficulty that you encounter a good many times with the sheet steel suppliers, is in their brushing. From a hot roll, they pickle. They get an acid etch in the steel. They may not get all of the scale off, and as they bring it down through their cold rolls a certain amount of that will roll in. It is just as Mr. Hogaboom said, it is actually brushed over the top. But if you take one light cut across there, everything in the steel opens up, and as a matter of fact you don't need a micrographic camera to see it; you can see it with the naked eye, although they do prove the point by taking photographs, in order to control it through the inspection department.

The cold rolled suppliers like the American Steel & Wire are going in for continuous mills, paying a royalty to the American Rolling Mills Company, but there has been an attitude existent on the part of the cold rolled steel men that they put a polish high enough on there, to nickel plate and buff and get the highest finish, and they generally come back with an argument, "What do you polish it for? We polish it on the rolls." Well, after all, the rolling process is a form of polishing, and, as Mr. Hogaboom says, it rolls everything in and brushes over. When it is necessary to polish, due to a drawing operation, or due to the scratching it gets in handling, it is then that all these evils that lie underneath the steel show up, and it is the plater who has the job of telling his management the steel mill must be tightened up. We have even offered to pay bonuses for better grades of steel, and we have had the super steel that was as bad as common steel.

* Westinghouse Electric and Manufacturing Company, Mansfield, Ohio.

The only satisfactory way we have found has been to tie them up so that they pay for rejections, and it holds them in very good line, once you get the problem over to them. I know the Greer Steel Company and the American Steel & Wire Company both have put in polishing set-ups whereby they can test a sheet of steel to see how it would stand up for plating and polishing operations. But it is really surprising, their ignorance of the plater's requirements in steel. They think the whole thing lies in that rolled surface, and that is not the case.

Here is a little trick we use in practically every plant of any size. A purchasing department generally likes to buy from several suppliers, and they have one stock argument, and that is that if this place would burn down or blow up they would be out of the source of supply. It is a pretty good argument and hard to beat. In a standardization program, through the factory, where you have wage incentives, where you have a standard set-up for your product, the shop man's job is trying to standardize everything, including all raw materials. If he has to standardize what he controls, he insists on the other fellows standardizing. We found one of our greatest troubles was to know whose steel was giving the trouble. For instance, we might have Newton Steel, American Steel & Wire, Armco, Greer Steel, and maybe two or three others in process, and as soon as it is sheared or blanked out you lose the identification. So we worked out a very simple method of marking steel. We use a solution of 75 per cent lacquer thinner, 10 per cent lacquer, and 15 per cent aniline dye, blue, green, red, brown, yellow, and so on down the line. Now, for each supplier we have a color. Then we take a tube and put a piece of felt in one end and a cork in the other, and the inspection department, as they inspect this steel, draw a stripe clear through the sheet. That stripe comes off the minute it strikes the first polishing operation or the minute it strikes the first cleaning operation. It contains just enough lacquer to make it stick so that you can see it. Now, in a sheet, if you blank out a piece, that line of color will run through, and be on every piece, no matter how many you make out of that stripe. Well, blue to us would mean Greer Steel Company, and if that steel wou'd commence to break in a draw press, or develop a lot of pits, scratches, and things of that kind, we would go back and pick up this blue mark, pick up that shipment, and Greer Steel Company would get a bill from us for the extra work. And if it runs into any great amount of money we will hold up the shipment entirely, and many times ship it back. It is not much of a trick, but it certainly has saved the shop a lot and kept us out of a lot of arguments.

Metal Polishing

By F. W. HOBBS

Manager, Hobbs Electroplating Company, Bangor, Maine

Some Practical and Pertinent Observations on Shop Practice

AFTER forty years experience in metal polishing and plating I am of the opinion that a vast amount of misinformation is to be had for the reading and that rule-of-thumb methods still have a rather firm hold on many of those following the trade.

Recently I have read that wheels should be set up with a good grade of hide glue, melted in twice its weight of water. To one who has used different grades of glue this is obviously poor, and in fact, misleading advice to a novice. Some years ago I tested out seven different samples of glue offered to polishers. The amount of water required to produce the required consistency varied from two to five parts of water to one of glue. Had the advice above quoted been followed with the five to one sample, its application to the wheel would have required the substitution of a putty knife for the usual brush.

I may remark in passing that in my test it was not the glue that required the least water or that which took the most, that gave best results, but rather one which stood about half way between.

It is a well known fact that glue should be freshly melted and it is economy to throw out any that may remain at the end of each day rather than carry it over for use the following day.

Another glaring misstatement that has come to my attention is that emery or an artificial abrasive will do equally well.

There is no possible question among the well informed as to the comparative values of these materials. Carbide of silicon, under whatever trade name, for polishing all metals aside from steel, is so far superior that the use of emery would be a gross waste of time and money. The same holds true regarding electrically treated bauxite marketed under various trade names, for grinding and polishing steel. Emery is decidedly out of the running.

Some shops, although having various grades of castings, etc., to finish, have a hard and fast rule of roughing on a certain grade regardless of surface condition. This it seems to me not good practice since in some cases the first operation might be eliminated, and in other cases a finer grade might be substituted, thereby reducing cost of labor and material.

A top dressing or thin coating of glue over the abrasive is advised by some polishers. My experience is that while it prolongs the life of a wheel it also slows up the cut so that the practice does not seem economical.

Probably most polishers realize that after a wheel becomes too badly worn to continue on straight work it still does good work on curves and corners, and that a wheel first used on curves and corners is not suitable for straight work until it is set up again. Therefore it is economy to handle work twice for each grade, doing the straight part of each piece first, then rehandling to do the corners, after the wheel is too dull for straight work.

Finally, I am unwilling to believe as has been said, that there are not the good polishers that there used to be. A lot of the poor polishing to be seen is not the work of poor polishers, but rather the result of competition, where quantity rather than quality is the rule, and the workmen are not allowed to show their ability.

The Bullard-Dunn Process of Cleaning

By FLOYD T. TAYLOR
The Bullard Company, Bridgeport, Conn.

An Explanation of a Process for Removing Scales and Oxides, Singly or in Combination, from Metal Surfaces

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, AUGUST, 1931

THE Bullard-Dunn Process for removing scales and oxides, singly or in combination, from metal surfaces is interesting from several angles. This process removes the scales and oxides without pitting, without etching and without hydrogen embrittlement. When it is used there can be no such thing as overtreatment, since when the treatment is longer than necessary, no damage is done to the work, the only loss being the loss of time and an unnecessary use of electrical energy.

Heat treatment scales can be removed without any effect on the depth of the "case," and this is true whether the work is oil or water quenched.

Work cleaned in the process is so perfectly cleaned, even to the bottom of crevices and scratches, that visual inspection of the piece becomes easy, so that hardening cracks and other defects are readily detected, and consequently in actual practice defective parts are rejected

Specimens of Work Before and After Cleaning by Bullard-Dunn Process

directly after the cleaning process, avoiding altogether the expense of subsequent operations done on defective material. When gears are cleaned, scale is removed from the entire surface, including the bottom of the teeth, so that when these gears are assembled in a train there is no cutting from flaked-off scale, which when it mixes with oil forms a cutting combination very destructive to the life of gears. Moreover, the element of inspection just mentioned makes it almost an unnecessary thing to assemble a gear train with a defective gear which is likely to break and damage the whole gear train, causing a considerable loss either in the test operation of the machine or in the regular operation later on.

The machining of parts which have been cleaned in the process is cheap and easy because scale is removed entirely, and consequently the first cut can be a real first cut and not merely a scale-removing cut. The tool edges are not dulled by a scale-removing cut, therefore the life of the tools and the number of pieces that can be machined between the tool regrinds and resets is very much increased.

Polishing is very much reduced in cost when metals are previously cleaned in this process. Where metal with scale on it is polished, the first polishing operations are merely grinding operations done with polishing wheels, and the very nature of a polishing wheel, composed as it is of flexible abrasive face held to a compressible revolving wheel by a layer of adhesive, seriously limits the mechanical strain that can be put on the abrasive face. Where perfectly clean metal is to be polished, the strains on the polishing wheel are reduced, wheels do not glaze, and consequently the polishing is simpler and cheaper.

When this process of cleaning is used prior to plating, the definitely clean and scale-free surface which it produces will permit an original metal crystal growth of uniformity over the whole face. The avoidance of selectivity of the first film of electro-deposit means that such electro-deposited coatings are very much less porous than they would be if the initial deposit is selective and when the plated coating represents actually a development of nuclei.

The nature of the process itself is interesting in that the scale and oxides are removed by the mechanical action of hydrogen gas developed between the scale or oxide and the base metal itself.

Lead or any other suitable metal, which is a part of the scale-removing bath, is simultaneously deposited in an extremely thin, dense film on the bare metal thus exposed, and this protective metal film then laid down prevents the base metal itself from beng affected in any way by the treatment. The scales and oxides blasted off the piece drop to the bottom of the tank as a sludge. It can be filtered out, and when solutions are filtered the result is that the life of the solution will be lengthened. If, however, the solution is not filtered, this sludge slowly dissolves in the weak electrolyte and will gradually build up a metallic content of the base metal in the solution. The building up of this metallic content, it should be noted, is slow, for two reasons: first, because the scale itself dissolves very slowly; and, second, because none of the pure base metal is dissolved at all.

The process is not a pickling process as pickling processes are commonly understood, since pickling processes dissolve the scale slowly and the base metal rapidly as the scale is sufficiently dissolved to permit the acid to attack the clean base metal. Only from the standpoint of technical definition that any acid solution is classed as a pickle and that any work treated in such a solution is technically said to be pickled, can this process be classed as such. In practice, however, we repeat that the process is distinctly not pickling.

Furthermore, the process should not be classed as a plating process because it seems logical to consider an electroplating process as being a process which will produce dense, adherent metallic coatings of appreciable thickness. Only the microscopically thin film deposited simultaneously with the removal of the scale in this process is dense and adherent. In other words, lead will plate on base

metals in the sulphate-chloride electrolyte used in the process, but lead will not deposit on lead in a dense adherent coating in such an electrolyte. Therefore, after the film of lead has been deposited, any further deposition of lead is in the form of a loose, non-adherent powder which can be readily removed by rinsing or brushing.

As stated, the electrolyte used in the scale-removing treatment is usually composed of sulphuric acid and water with the addition of a small amount of chlorides. Lead anodes are generally used, although anodes of other metals are used for special applications. The work is treated in the scale-removing bath as the cathode.

The lead film can either be left on the work, in which case the scale-removing treatment is reduced to a single treatment followed by rinsing, or this lead film can be very quickly and thoroughly stripped by a short subsequent treatment in an alkaline solution with reversed current; that is, making the work the anode.

Where the work is to be machined or polished after the scale is removed, the lead film is left on because it is sufficiently thin to cause no difficulties and, as a matter of fact, in machining and drawing operations it will give a very slight element of metallic lubrication. In polishing operations it is not sufficiently thick to load the face of a polishing wheel, but it is thick enough to give a highly desirable approximation of a grease wheel effect.

The process can be operated continuously, as the control of it is simple from every angle. The temperatures are not high, being about 150° F. in the scale-removing treatment. The current density is moderate, running from 60 to 75 amperes per square foot. Happily such current densities can be obtained with ordinary six-volt standard electro-plating dynamos and the average anode to cathode spacing used in electro-plating. This means that the investment in motor generator sets is low, and that existing electro-plating equipment can readily be altered to give the advantages of the Bullard-Dunn Process for cleaning scales, oxides and metallic films from the work just prior to its being placed in the electro-plating bath. The chemicals used in the solutions are non-poisonous and fumes only need ventilation common to modern plating rooms.

The time cycle for the Bullard-Dunn Cleaning Process varies with the nature of the metal, the nature of the scale, and with the thickness of the scale. For example, low carbon steels can be freed from annealing scale in two to three minutes, high carbon steels in five to ten minutes, alloy steels in longer time, depending upon, as pointed out, the nature of the alloy and the nature and thickness of the scale; but in every case the scale can be removed completely without any damage whatsoever to the base metal or any loss of base metal itself, in times that are always very considerably under the time required by pickling or any other known process.

The history of the development of the process is sufficiently interesting to justify an outline of it.

Some five years ago the Bullard Company undertook to manufacture automobile bumper bars in addition to their line of big automatic machine tool units.

As you know, a bumper bar is made by taking a steel bar, heating it and forming it. The bar is then heat-treated to convert it into a spring. It is then finished.

The Bullard Company had no sooner begun the manufacture of bumper bars when they ran into difficulties with their polishing on account of the heat scale produced when the bumper bar is converted into a spring. They thereupon set to work to find a method of removing this scale. After consulting with various and sundry experts, all the methods suggested were tried out. None of them could be considered satisfactory.

Sandblasting was expensive and ineffective since it did not remove the scale thoroughly, but actually merely broke up the surface scale and left the bar with small splinters of scale embedded into the surface. The back side of the bar was not well cleaned, so that the scale left on it formed a perfectly good breeding ground for corrosion. The eye of the bumper bar, which, as you know, is customarily used to hook the work to the plating racks, was not cleaned, and this resulted in a poor electrical contact which interfered with good electro-deposition.

Scratch brushing had all of the faults just described in connection with sandblasting, except that scratch brushing did eliminate the excessive air cost, nozzle wear and general destructiveness of the sandblast method, whether sand or steel shot was used. Scratch brushing was an expensive operation from the standpoint of thorough scale removal. Rolling and tumbling were equally poor.

Pickling was then used with and without inhibitors, with and without current, direct, reversed and alternating. None of these methods were satisfactory. All forms of pickling produced pitting and etching, and hydrogen embrittlement. The pitting and etching magnified the difficulties of polishing instead of simplifying them by merely removing the scale.

After all these methods were tried out and all the suggestions secured from the various experts were worked over, a complete new start was made on the problem. This new start resulted in the discovery of the Bullard-Dunn Process for metal cleaning, which, as has been stated, is completely successful and unique in that there are no references to any such process either in the patent office records or the literature of this country, or any other where such records exist.

The bumper bars at the Bullard plant, before the discovery of the Bullard-Dunn Process, were polished beginning with No. 30 wheels. After these bars were cleaned by the Bullard-Dunn Process with the lead film left on, the first polishing wheels were set up with No. 90 abrasive.

A noticeable improvement was made in the plating, probably due to the better contact between the plating rack and the bar itself as a result of the cleaning of the eye of the bumper bar, but this improvement in plating was strikingly exhibited by the plate on the back side of the bumper bar, which was very much better from every standpoint because the back side of the bar was completely free from scales and oxides.

Now, immediately after the discovery of the advantages of this process for cleaning bumper bars, the Bullard Company applied the process to the cleaning of all forgings, heat-treated parts, and alloy gears used in their regular machine tool production. The savings which they have been able to make through this use of the process and the improvement of the quality of their finished product as a result, is the thing that prompted them to offer the process to industry in general where it has many interesting and useful applications.

On the question of costs, the cost of the process apparently is competitive with the cheapest kind of pickling because such elements as a shortening of time, absolute freedom from the spoiled work of overpickling, and reduced upkeep on equipment, are factors that offset the additional costs of using this process as compared with pickling. For example, the cost of electrical energy which is not required in ordinary pickling but which is naturally a part of the Bullard-Dunn Process.

As contrasted with electro-pickling, this process has the advantage of requiring very considerably less electric energy, since the lead film deposited in the Bullard-Dunn Process produces a "stop-off" effect, which with electro-pickling must be approximated by the maintenance of the thick film of hydrogen gas over all parts of the cathode, and this gas film maintenance means high current density; in fact, a current density which is frequently impractical.

Lead Fittings for Modern Dwellings

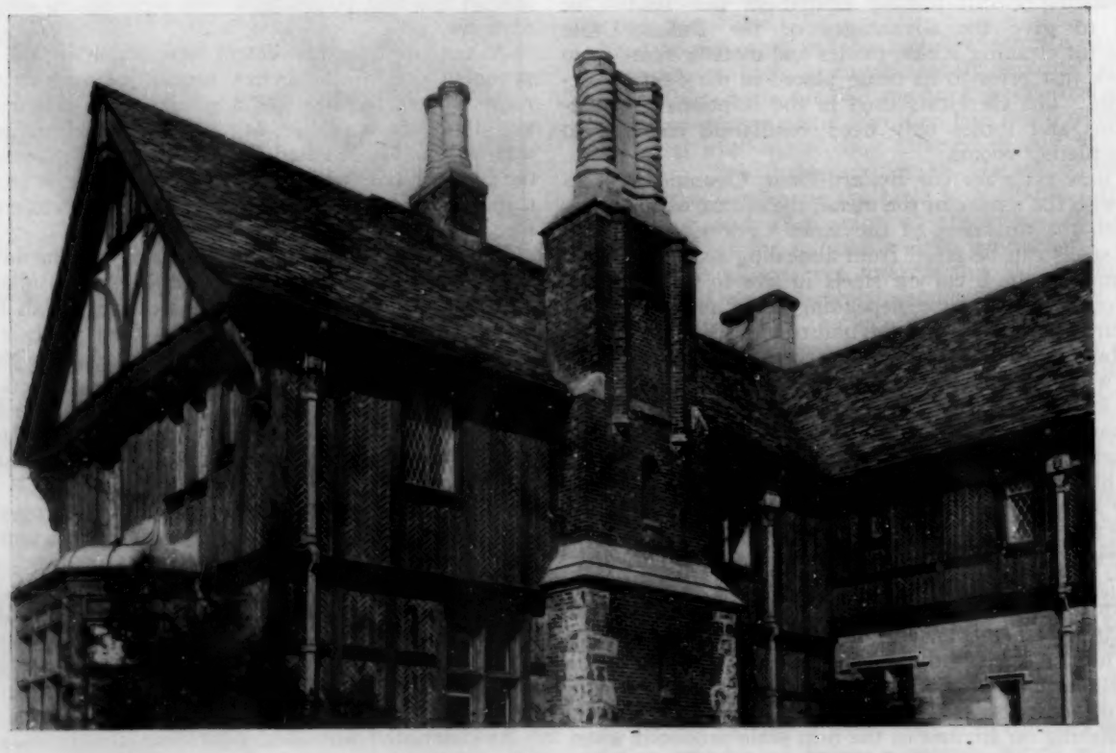
LEAD is becoming increasingly popular as a decorative as well as utilitarian metal for homes, according to the Lead Industries Association. The illustrations here show some applications. There are many others, such as cisterns, flower boxes, drain pipe heads, gutters, etc., and such interior uses as for fireplace hoods, leaded sashes, and numerous other objects.

At right is shown a lead garden piece. Many other objects are being produced of cast or rolled or beaten lead for decorative use in gardens. There are animals, birds, and many other figures for placing on lawns and elsewhere around the country place or the city house garden. Below is shown a large residence decorated with numerous lead fittings.

Lead takes an important place in ornamental metal work because of its artistic traditions and inherent qualities. Its beauty, its capability of artistic manipulation, its ductility and durability recommend its employment. Lead takes on a silvery gray or whitish brown patina when exposed to the weather.

A very good pamphlet on the architectural use of lead has been issued by the Lead Industries Association, 420 Lexington Avenue, New York. Metal men should look it over with a view to producing for this growing market. The illustrations on this page are reproduced by courtesy of "Your Home," a Macfadden publication.

A Beautiful Lead Garden Wall Decoration



This Home Has Lead Gutters, Pipe-Heads and Leaders, Sun-Dial, Bay-Window Roof, Flashings, and Leaded Windows

THE METAL INDUSTRY

With Which Are Incorporated
The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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Editorial

Business and Wages

A NEW element has come into prominence during the last three months in the discussion of ways and means to cure the existing business depression—namely, wages. There have always been two sides to this controversy, one maintaining that high wages brought with them prosperity because of the high purchasing power of the large wage-receiving masses, which stimulated demand for manufactured products, thus in turn stimulating factory output. The other side claims that wages have been unreasonably high and that they have choked manufacturing operations, leaving insufficient margin for profits. At the present time, with profits either small or non-existent, the discussion has redoubled.

The administration in Washington has been firm in its opinion that wages should not be reduced. In fact the manufacturing interests have been strongly urged to hold up their wage scales. That this has had considerable effect is obvious from the action of the United States Steel Company which is going to great lengths in other directions, reducing dividends and cutting salaries, but leaving wages intact. Nevertheless, it is commonly known that a great deal of wage-cutting is going on among the thousands of smaller companies outside of the spotlight of publicity. Reductions are being made even by some of the large organizations in the textile industries and lately one of the leading steel rail producers has made sharp reductions in wage rates. Nevertheless, the consensus of leading opinion seems to be that such measures are regrettable. The Charles E. Bedaux Company of New York states explicitly that "if stockholders in all our industries will consent to accept smaller dividends on their invested capital and thus make possible the fullest employment of our wage earning class at the best rates industry can afford to pay, then the depression will be short lived and America will soon find itself on the highroad to prosperity." J. L. Snider of Harvard University is of the opinion that wage reductions cannot be justified on the ground that they will stimulate business revival. He admits, however, that they may be dictated by necessity.

It is likely that much of the agitation for the reduction of wages is caused by the rates paid to some highly skilled and closely controlled trades, far in advance of the average throughout labor in general. There has been much discontent not only among employers of this type of labor but among employees who are not similarly protected and benefited. It is widely rumored, however, that in actual practice these wage rates are not being upheld. In a large number of cases the men prefer to take less in order to remain employed even though they have to do so secretly.

A general and approved horizontal reduction in wages would probably defeat itself as an aid to business. The outstanding need at this time is not the expansion of business profits at the expense of its largest consumer, labor, but rather the expansion of purchasing which will draw forth increased manufactured products. Give us demand, and prices and profits will take care of themselves. We are plentifully supplied with facilities, plant and equipment. We need demand. We also need intelligent competition, the elimination of foolish bidding for business which only hurts, even the concern which finally gets the orders. We need co-operation between the competitors perhaps through the medium of a revision of our antiquated anti-trust laws. Our golden-egg-laying goose is buying power, and under no circumstances should shortsighted policies be permitted to kill it.

Lighter Alloys

WITH the spectacular increase in the growth of the aircraft industry and with the coincident demand of the public for greater speed in its transportation facilities, has of course, come the expansion in the use of light metals and alloys. Aluminum almost instantly took its place at the head of all other metals.

It has long been known, however, that aluminum is far from being our lightest metal. Magnesium is fully 30 per cent less in specific gravity. Beryllium is not far from magnesium in weight, but it is so much further behind in its development that it has a long distance to go before it can be considered really commercial.

Magnesium has been before us for a number of years. Elektron metal has been in use in Germany for a decade for automobile pistons and other parts. According to Paul Thornton, who recently delivered a paper on this subject before the Society of Automotive Engineers, magnesium alloys will soon be in use in automotive and aircraft apparatus. Magnesium has its drawbacks but its light weight is a tremendous advantage. Its strength-weight ratio in alloy form is said to be considerably higher than that of the aluminum alloys, even the heat treatable ones. Magnesium is attacked by salt water but will resist corrosion of many chemicals, and also stand up well against outdoor exposure. A water-resisting spar varnish in which aluminum bronze powder is incorporated is said to be a good protective coating.

There should be a good future for magnesium alloys which will eventually call for real tonnage production.

Growing Use of Silver

THE silver industry is suffering like all others, but in this time of storm and stress have come developments naturally, which will be of great value to it when industry emerges from its present slough. Due to its low price, silverware sales have increased. Jewelry is now using silver for mounting inexpensive stones for which formerly base metals were employed. Low and moderately priced novelties can now be made of silver. The use of silver solders is expanding and silver is now specified in various forms for parts in airplanes, radio apparatus, musical in-

struments, electrical appliances, chemical apparatus, electric refrigerators and even turbines.

Probably, at this time there is little or no profit for manufacturers of silver products. But these new markets, once having been taught the value of silver as a material, will increase their demand, and even if prices do not rise sky-high, these increased demands, stimulating production up to a point where operations become profitable, will find their reflection in the improved balance sheets throughout the silver industry. With the standard users of silver remaining faithful, as are the photographic industry and hollow ware, the long-pull prospects for the silver producers and manufacturers seem to be somewhat brighter than they have been for the last two or three years.

Plated Versus Solid Metals

THE time is coming soon, if it is not already here, when plated metals will be faced with the direct competition of solid metals, having or claiming properties, as good as or better than the coated articles. For a long time non-ferrous alloys held to themselves the field of corrosion resistance, being almost indispensable in many varied engineering fields. In recent years these same non-ferrous alloys have widened their activities to include decorative uses, claiming the advantage of permanence in wearing qualities and, to a lesser extent, in appearance.

The advent of the stainless steels, the high nickel-chromium alloys, is the most recent, and probably the most severe thrust at non-ferrous alloys and plated metals which industry has witnessed. These stainless steels are now reaching for markets which formerly were open only to those alloys and plated finishes which could satisfy the public demand for attractiveness. The high cost of stainless steels, due to the comparatively expensive nickel and chromium and the difficulties of working, is still a bar to their general acceptance. It seems, moreover, very doubtful whether these special ferrous alloys will ever be as cheap as the common non-ferrous metal combinations or plated finishes on a cheap metal base. Recognition of this fact is shown by the recent development of a "ply metal" which consists of an ordinary steel base with a thin integral surface of a chromium-steel alloy, veneered and weld-bonded and then rolled onto it.

Active research must, therefore, be continued and increased in the non-ferrous alloys and the electroplating industries. Copper base alloys, widely explored as they have been, must go on producing stronger and more permanent forms. Electroplating must produce heavier, more homogeneous and more attractive finishes. The electroplating of alloys is an enormous domain into which only a few short steps have been taken. Is it altogether impossible for nickel chromium iron alloys to be electrodeposited?

Competitors of Platinum

A RECENT issue of Research Narratives published by Engineering Foundation of New York, tells an interesting story of a man who set out to find a cheap substitute for platinum. It seems that originally platinum was the best known material for the core of the filament of radio tubes. Its performance was eminently satisfactory, but the fly in the ointment was the fact that material for filaments was costing $186 an ounce. Dr. E. F. Lowry of the Westinghouse Research Laboratory undertook a research for a cheaper substitute. He found that pure nickel gave surprisingly good results but he could not convince the trade that it would do. It seemed too cheap. Finally he made a filament of nickel, cobalt and ferrotitanium in proportions of 80, 20 and 10, which gave even better results than he had before obtained. He named the new metal Konel, and persuaded his company to make a few commercial tubes, using it as a filament core. Shortly afterward (in 1927) the whole radio industry swung away from platinum and to the use of nickel or Konel.

There is more in this story than the simple tale of a successful research. Meritorious as it was, there have been dozens and perhaps hundreds of others like it. The important point is the concentration of effort in the direction of producing adequate, satisfactory products at the lowest possible cost. The driving impulse was to make things more and more cheaply, keeping up the standard of quality.

Platinum as a raw material in industry has suffered from its high price which is, strangely enough, one of the reasons for its popularity in jewelry. The sharp reductions which have occurred in past years have probably helped it to some degree to retain its position in many places, but essentially it is a very precious metal, the use of which is to be avoided whenever possible, because of its high cost.

There are, however, many uses for which it has no satisfactory substitute as yet. In jewelry, it is still strongly entrenched because of its strength, hardness and beauty, especially when alloyed with iridium. In the electrical industry it is largely used for contact points. In chemical laboratories it is still the best material for electrodes and certain small-scale commercial electrochemical work. In the chemical industry it is largely used for catalyzers in the manufacture of sulphuric, acetic and nitric acids and for chemical ware in the form of crucibles, dishes, evaporating pans, etc. According to a statement from the U. S. Bureau of Mines, the contact process for making sulphuric acid is now using from 500,000 to 600,000 ounces of the metal.

The greatest substitution for platinum has taken place in the electrical industry, but it is also being displaced for surgical and dental instruments by Stellite and other alloys of chromium, tungsten and cobalt.

The price history of platinum reflects the varied effects of the numerous factors operating in the different industries in which it is used. In the 1880's it was worth only $5 an ounce. In 1913 it sold at $45, went over $150 in 1919 and 1920, and dropped to $65 in 1929. At the present time it is selling for about $40.

Platinum refiners in the United States produce about one-third of the world's supply of refined new metal, but the bulk is produced from crude platinum from foreign sources, notably Colombia. In Russia production, which before the war, rose as high as 300,000 ounces per year, fell off to 25,000 ounces in 1917, but it is now rising slowly, the last figure given being 40,000 ounces obtained in 1922. South Africa in which platinum was discovered in 1923, is now the third largest producer and in 1928 contributed 23,600 ounces. This country however could easily enlarge its capacity to permit an annual output of over 100,000 ounces. Canada is also expected to increase its production substantially from the Sudbury nickel-copper deposits. The United States as a producer of platinum ore is almost negligible, as even in its principal producing localities, California, Oregon and Alaska, the deposits are small.

Correspondence and Discussion

Contributions from the Fellowship Club

To the Editor of THE METAL INDUSTRY:

This is to acknowledge the receipt of two checks amounting to $10, through Mr. T. A. Trumbour from the International Fellowship Club. This money will be placed to the credit of the International Fellowship Club in the Research Fund of the American Electro-Platers' Society.

Allow me to express my sincere appreciation to the members of your Club for their interest in our Society.

AMERICAN ELECTRO-PLATERS' SOCIETY,
PHILIP SIEVERING, PRESIDENT.

To the Editor of THE METAL INDUSTRY:

In behalf of the American Electro-Platers' Society, I wish to acknowledge your generous gift of $70, through Mr. T. A. Trumbour from the International Fellowship Club, to the Research Fund. Aside from the donation itself, the Society appreciates your endorsement of our research program. Kindly accept our gracious thanks.

AMERICAN ELECTRO-PLATERS' SOCIETY,
H. A. GILBERTSON, SECRETARY-TREASRER.

Best for Twenty-Seven Years

To the Editor of THE METAL INDUSTRY:

Enclosed herewith is a check for renewal of my subscription. . . I just noticed that this is my twenty-seventh consecutive year as subscriber to THE METAL INDUSTRY. Well, I don't stick to any one thing that long unless it is better than anything else obtainable.

Best wishes for the publication, and kindest regards to the entire staff.

WALTER S. BARROWS,
Foreman P'ater, Canada Cycle and Motor Company,
Toronto, Canada. Weston, Ontario, Canada.

When Were Sand Cores First Used?

To the Editor of THE METAL INDUSTRY:

Can you tell us when the first sand cores were used in moulding?

Guilford, Conn. THE C. H. HILL COMPANY.

I do not have the data on this and would not like to guess. I put the question to a number of sand producers and expert sandmen but no one seems to have this information. The question is a simple one, but I regret that I do not have the information desired.

Detroit, Mich. W. J. REARDON.

New Books

Symposium on Aircraft Materials. Published by the American Society for Testing Materials. Size 6 x 9, 192 pages. Price $2.00.

This is a compilation of a symposium presented at the annual meeting of the American Society for Testing Materials, June, 1930, covering all of the different types of materials used in aircraft, such as metals (ferrous and non-ferrous) wood, textiles, corrosion prevention materials, finishes, etc. Methods are also discussed, such as stamping, forging, casting, welding, joining, chemical testing, x-ray testing, heat treatment, etc.

Industrial Research Laboratories of the United States. Compiled by C. J. West and C. Hull. Published by the National Research Council, Washington, D. C. Size, 6½ x 9¾, 267 pages, paper covered. Price $2.00.

This is Bulletin No. 81 of the National Research Council, now in its fourth edition. The book contains an alphabetical list of about 1625 laboratories, a list of more than 1900 directors of research, a geographical index and special index. These lists include consulting research laboratories.

Yearbook of the American Bureau of Metal Statistics, for 1930. Published by the American Bureau of Metal Statistics, New York. Size 8 x 11, 126 pages, cardboard cover. Price $2.00. (Direct from the publishers).

This book is in its 11th annual issue and is the leading authority on the production and consumption of metals produced and used in the United States. It covers copper, lead, zinc, gold and silver, tin, antimony, nickel, platinum, aluminum and cadmium.

Testing and Grading Foundry Sands. Published by the American Foundrymen's Association. Size 6 x 9, 151 pages, paper covered. Price payable in advance, $3.

This is a compilation of the standards and tentative standards adopted by the American Foundrymen's Association following recommendations of its Committee on Molding Sand Research. It covers methods of sampling; selection and preparation of samples; determination of moisture; permeability tests; strength tests; fineness tests; green sand molding surface hardness; chemical analysis of foundy sands, dye adsorption qualities of molding sand; sintering test of molding sands; testing sand; core tests; sand grading classifications; bibliography.

Metals and Their Alloys. Published by Louis Cassier Company, London, England. Size 6 x 9, 136 pages, cardboard covered. (Direct from publishers).

This is an annual publication giving the percentage compositions of 3,500 non-ferrous metals and their alloys, the breaking strength of a number of metals and alloys, some particulars of all the known metals, electrochemical equivalents of metals and specific resistances of metals and alloys.

Government Publications

Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, applications should be made to the governmental body responsible for the publication.

Thallium. Bureau of Mines, Department of Commerce. Information Circular 6453, by Alice V. Petar.

Zircon (The Gem.) Bureau of Mines, Department of Commerce. Information Circular 6465, by E. P. Youngman.

Bismuth, by Paul M. Tyler, Bureau of Mines, Department of Commerce. Information Circular 6466. Complete report on this metal. Apply to Bureau.

Bronze Pipe Fittings. Proposed Federal Specification for threaded, 250 lb., bronze pipe fittings. Copies available from Federal Specification Board, Washington, D. C.

Quartz and Silica, by R. M. Santmyers, Bureau of Mines, Department of Commerce. Information Circular 6472, in 3 parts, 15, 20 and 17 pages, respectively.

Zirconium. Part 1, General Information. Bureau of Mines, Department of Commerce. Information Circular 6455, by E. P. Youngman. Part II, Domestic and Foreign Deposits. Information Circular 6456, by E. P. Youngman.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

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W. J. REARDON — P. W. BLAIR

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Solutions sent for analysis must be PROPERLY PACKED, to prevent leakage and breakage. Chromium solutions should be sealed with glass stoppers. Label with name and address of sender. Mail all samples to 99 John Street, New York.

Brass Solution

Q.—Am sending a brass solution for analysis. This solution is 150 gallons, and is operated at 90° F, with 7 volts. It is a barrel plater. The work comes out red, with no plate at all on the edges of the work. Would be grateful if you could find the trouble and how to rectify it.

A.—Analysis of brass solution:

Metallic copper	6.95 ozs.
Metallic zinc	1.16 ozs.
Free cyanide	3.49 ozs.

Analysis shows the solution to be in a poor operating condition. The metallic copper content is too high and the metallic zinc and free cyanide contents are too low.

Would suggest that you take one-third of the solution from the tank, then add 4 lbs. of zinc cyanide and 30 lbs. of sodium cyanide to the solution and fill tank to proper solution level with water. Be sure to dissolve the zinc cyanide and the sodium cyanide before adding to the solution.

If the solution is operated at 90° F. and the color is too red, add a small quantity of 26° ammonia to the solution. Avoid an excess.

—O. J. S., Problem 5025.

Bright Cadmium

Q.—I have just built a cadmium plating solution composed of the following chemicals: cadmium oxide, 3 oz. to gallon; sodium cyanide, 9 oz. to gallon; caustic soda, 2 oz. to gallon: and am using from 10 to 15 amperes per square foot. This solution does not work satisfactorily though I have taken particular care in the making of it. The deposits I obtain are rough on the ends that are nearest the bottom of tank; in other words, sandy in appearance with a burnt effect. They also show that the nearest point to the anodes plate bright while the center portion is dark. I have tried Instant Postum for a brightener, but this did not give me what I wanted as the brightness was not uniform in appearance. I found out that this was patented and have stopped using it. Please mention some way of overcoming this difficulty so that I may proceed in production as soon as possible. Also state some brightener that I may use so as to get a very bright deposit uniformly over the whole cathode or pieces that I am plating. My firm demands a very bright deposit of all cadmium plated pieces. The solution is a 130-gallon solution and has been working but a few days. I use one cold rolled flat steel anode to three cadmium anodes. My anodes show a very faint film of smut at the end of the day. I have added a small amount of sodium cyanide gradually, but this did not keep them clean.

A.—If you have made your solution from the formula given, we can see no reason why it should not operate satisfactorily. The dark rough deposit would indicate a current density that is too high.

Cadmium deposits are not bright unless brighteners are used. We would suggest that you try condensed milk as a brightener. The deposit may be brightened by using a dip made of water 1 gallon and nitric acid 1 ounce. Place the work in this dip for a few seconds, and then dry by the use of soap water and sawdust.

If you will send us a sample of the solution, we will analyze it for you.

—O. J. S., Problem 5026.

Changing Acid Copper to Bronze Solution

Q.—We are desirous of changing over an acid copper plating solution to a bronze plating solution. The plating tank containing this copper solution is 16′ long, 5′ deep by 3′ wide, and contains approximately 15,000 gallons, made up of one-half pound copper sulphate or blue vitriol to one gallon of water. We would have no use for this solution if we changed over to a bronze plating solution and would dislike very much to waste same.

What we are wondering is, would it be possible by adding some more certain ingredient to this present solution and thereby converting same into a bronze solution?

A.—It is possible to use the copper sulfate solution in preparing a bronze solution by adding carbonate of soda to the copper sulphate which would precipitate the copper as copper carbonate. In the chemical reaction there is also formed sodium sulfate which should be removed by siphoning off the clear solution and washing the precipitate of copper carbonate until free from sulfates.

It would then be necessary to dissolve the copper carbonate with sodium cyanide and then add zinc cyanide and sodium cyanide until a bronze of the proper color is obtained.

If you have no one that is familiar with the method of making copper carbonate, it would probably be best to discard the solution and use the cyanide of the metals in making the bronze solution.

The copper sulfate that the solution contains is only worth approximately $37.50 as a tank 16′ long, 5′ deep and 3′ wide will contain approximately 1,500 gallons instead of 15,000 gallons.

—O. J. S., Problem 5027.

Hard Chromium Solution

Q.—Would you kindly advise me about my chrome solution? I stored solution and, due to a bad roof but plenty of rain, the solution does not show any reading on hydrometer.

The tank was nearly half full, and is now nearly full. Some I had in barrels reads 30 on hydrometer. Capacity of tank 435 gallons. Could I do anything with the old solution?

Would you send me a formula for a good "hard" chrome solution, with directions for the upkeep and operating solution?

A.—We would not advise you to use the old solution or to try and replenish it. We would recommend that you use a steel tank lead and glass lined and to make a solution from the following formula:

Chromic acid	55 ozs.
Sulphuric acid	0.3 oz. by weight
Water	1 gallon

Operate the solution at 95° F. and a cathode current density of 50 to 75 amperes per sq. ft.

—O. J. S., Problem 5028.

Hydraulic Bronze

Q.—We are expecting an order for bronze valves that must stand steam pressure up to 600 pounds.

Can you give some information as to the best mixture to use for these valves, also how to mold same and the melting process?

Do you advise the use of phosphor copper, and if so, how much?

A.—We would suggest hydraulic bronze for the above work. This alloy is made as follows: melt 100 lbs. of copper and add 10 lbs. tin, and then add 25 lbs. yellow sheet brass. Add the tin a little at a time. Stir, and then add the yellow brass.

This alloy is very tough and strong, hard and non-corrosive. If properly made it can be recommended for the purpose you mention. It should first be cast in ingots and re-melted in order to make it dense, close-grained and able to resist corrosion.

Just before pouring add 1 oz. of 15 per cent phosphor copper with a handful of salt to the pot as a flux; and this should meet your requirements.

As to the molding of this valve, we would have to have the size and style of valve, whether screw or flanged.

—W. J. R., Problem 5029.

Manganese Bronze

Q.—We are trying to make some cast bronze parts for safety belts, and it is necessary that we produce a casting which will be of the highest possible strength. We are under the impression that Specification No. 43, Manganese Bronze, as given on page 535 of the S. A. E. Handbook—1930 Edition, is about what we want, but according to this specification, composition is as follows:

Copper	53.00 to 62.00
Zinc	38.00 to 47.00
Lead, max.	0.15

After giving this composition, the S. A. E. Handbook goes on to say, "This metal may be hardened by the addition of small amounts of tin, iron, manganese, aluminum or a combination of these metals." It would seem to us that if iron were added to this composition there would be a chance of there being some free iron particles in the casting, and then when we tried to machine the castings, these free particles of iron would ruin our tools. However, it would seem all right to us to add small amounts of tin, or manganese, or aluminum, but the Handbook does not say how much of these elements to add or when to add them.

A.—The mixture you refer to is SAE 43, called manganese bronze, and is composed, as you have stated, of copper, 53 to 62; zinc, 38 to 47; lead, .15.

Hardened by small amount of tin, iron, manganese, aluminum, the mixture is made of approximately 56 copper, 40.75 zinc, 1.50 iron, 1.00 tin, .50 aluminum. The iron, tin and manganese are made up as a hardener which can be purchased from the manufacturers of alloys, or can be made by you if so desired.

The copper is melted first and made good and hot. The hardener is then added and stirred well. The zinc is then added and stirred, then the aluminum. The iron goes into solution and if made properly will not separate and give trouble in machining. However, you can make an alloy that will give you very nearly the same results without the use of iron, but will be somewhat softer, so we suggest you try the following: 58.50 copper; 41 zinc; .50 aluminum. Melt the copper; get good and hot. Add the zinc a little at a time. Stir well, then add the aluminum. You should get approximately 65,000 tensile per square inch, and less trouble to make.

—W. J. R., Problem 5030.

Pickling Brass and Bronze

Q.—What we wished to know was what acids are used to improve the appearance of brass and bronze castings and the proportions?

A.—In our files we have the following information. The best pickling solution consists of commercial sulphuric acid 8 to 10 parts and 100 parts water. Making the solution stronger retards the work. The cleaning proceeds most rapidly at 140 to 160 deg. F., and ordinary oxide will be removed within 20 to 30 minutes. When the sand is burned on the casting, it may take 15 to 20 minutes longer. The action of the acid may be facilitated by going over the castings from time to time with a scraper or wire brush. It helps, also, if the casting is put into the pickle before it cools. The resulting quick contraction cracks off or loosens the scale on account of the difference in the coefficient of expansion of the metal and the crust. If the acid gets under the scale it can complete its work more quickly.

After this pickling, copper zinc alloys have a soft frosted yellow color, while copper tin alloys are usually rather more red owing to the unequal corroding of the two metals. Castings, as a rule, have a mottled appearance.

Rinsing should take place in a tank of running water, for any acid that is not removed causes discoloration. Sawdust is preferred for drying, since if it is evaporated off the water leaves a thin crust on the casting of any solids which it may carry in solution, which may interfere with plating, etc.

Oak that has been impregnated with creosote is the best wood for tanks. It should be lined with 3/16 or ¼ lead and its seams carefully burned to prevent leaks.

The color of the castings after pickling may be improved by a short immersion in a mixture of undiluted commercial sulphuric and nitric acids. If a little common salt and lamp black are added to this bath, the pieces will have an especially fine finish. Earthenware vessels are the only sort that will stand this concentrated acid mixture.

The treatment of the casting is ended as soon as brown vapor begins to appear. It must then be rinsed immediately in clean water and dried in sawdust. If the castings are too large for a crock, the strong acid can be poured over them, but this requires considerable skill.

About 1 part salt and ½ part lamp black are used to each 100 parts of acid mixture.

If these acid finished castings are exposed to the air for a time, they will become oxidized, no matter how thorough the rinsing and drying may have been, as it is impossible to get absolutely all of the acid out of the little pores of the etched surface. In order to retard this as far as possible, immerse for a short time in a dilute solution of argole, which leaves a thin, transparent skin on the surface after drying that affords a fairly satisfactory protection.

The bright dip mixture for brass as given in most text books consists of:

Oil of vitriol	1 gallon
Aqua fortis	1 "
Muriatic acid	2 "
Water	1 quart

—W. J. R., Problem 5031.

Stripping Nickel from Brass

Q.—Please advise us what you would recommend for stripping nickel from brass hardware without injuring the brass finish.

We are now using an acid strip, two parts sulphuric, one part nitric and one part water. We would rather use a strip on which we could reverse the current using our generator hook up.

A.—There is no strip that we know of to strip nickel from brass without some injury to the surface of the brass.

One that will attack the surface least is made of sulfuric acid 3 parts, nitric acid 1 part, muriatic acid 1 part. Mix the sulfuric and nitric acids, let cool, and then add the muriatic acid cautiously and a small quantity at a time.

When the dip has cooled to room temperature, the work is placed in the dip and left to remain there until the nickel is removed. All water should be kept from the strip.

With a reverse current, a sulfuric acid solution is used to strip nickel from brass and is made as follows. Concentrated sulfuric acid is diluted to 45° Baumé with water. When the strip is used at first pitting is usually noted. If a small quantity of copper sulphate or nickel sulphate (2 ozs. per gallon) is dissolved in the water that is used to dilute the sulfuric acid, less pitting will result. The strip should be used in a lead lined or stone ware tank and 6 volts reverse current used. Use cold.

—O. J. S., Problem 5032.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,806,806. May 26, 1931. **Apparatus and Process of Determining the Strength of Solutions.** Cyril Kocour, Chicago, Ill.

The process of determining the strength of solutions the intensity of the color of which bears a direct relation to the strength thereof, which consists in comparing the color of light transmitted through a body of the unknown and a neutralizing color screen with the color of light transmitted through a similar color screen and a body of material of the same color as the unknown, the intensity of which in terms of strength of the solution is known.

1,807,068. May 26, 1931. **Dental Alloy for Swaged Dentures.** Frederick Maulen, East Orange, N. J., assignor to Baker & Company, Inc., a Corporation of New Jersey.

A metal base for a denture formed of an alloy consisting of from ninety-five percent (95%) to ninety-nine per cent (99%) palladium and from one per cent (1%) to five per cent (5%) rhodium, respectively.

1,807,157. May 26, 1931. **Method and Machine for Electroplating.** James W. Hughes, Philadelphia, Pa., assignor to Budd Wheel Company, Philadelphia, Pa.

A method of combining electro-plating with "stripping" of deposited metal from artiele carriers, comprising the passage of an odd number of article carriers intermittently through an electrolytic solution, causing filled article carriers to have a negative electrical potential and empty article carriers to have a positive potential while at rest within said solution.

1,807,208. May 26, 1931. **Treating Textile Material with Chromium.** John Leathart Hankey, Sale, Manchester, England.

The process of fixing chromium on textile fibre which consists in treating such fibre with a mixture consisting of a chromate of an alkali metal and a sulphoxylate of an alkali metal, and ageing.

1,807,585. June 2, 1931. **Anode.** Julius Becker, Chicago, Ill.

In combination, an electrolyte for the electro-deposition of chromium containing an aqueous solution of chromic acid and an anode comprising steel containing about 0.25 per cent to about 15 per cent of silicon.

1,807,670. June 2, 1931. **Bearing Alloy.** John V. O. Palm and Edward C. Knuth, Cleveland, Ohio, assignors to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

A bearing alloy consisting of approximately 82 per cent lead, 7½ per cent cadmium, 7½ per cent antimony, and 3 per cent of zinc.

1,807,788. June 2, 1931. **Alloy of Lead and Antimony.** Paul Kemp, Vienna, Austria.

As a new article of manufacture, a lead-antimony alloy of greater than normal hardness, comprising a maximum of 10 per cent antimony, from approximately 0.2 per cent to approximately 2 per cent arsenic and from approximately 0.1 per cent to approximately 2 per cent tin, the tin content being substantially one fifth to the antimony content.

1,807,875. June 2, 1931. **Method of Electroplating and Product Thereof.** Karl Davis Robinson, New York, N. Y., assignor to The Meriden Gravure Company, Meriden, Conn.

The method of electroplating on metal articles which consists in coating the metal with gelatin prior to the electroplating step, drying the gelatin, causing the gelatin to swell to the required condition of permeability, then plating on the articles a metal through the gelatin in an electrolytic bath, and drying the gelatin coating.

A printing plate having a permeable colloid coating secured thereto by electroplating with a metal through the interstices of the colloid which forms part of the finished plate.

1,808,184—1,808,187. June 2, 1931. **Cleaning and Preserving of Metallic Surfaces.** Deal H. Tompkins, Nitro, W. Va., assignor to The Rubber Service Laboratories Company, Akron, Ohio.

A process of pickling iron and steel products which comprises subjecting the metal to be pickled to the action of a sulfuric acid solution containing a small proportion of a sulfuric acid derivative of a reaction product of sulfur dioxide and an aldehyde-amine product.

1,808,594. June 2, 1931. **Process for Separating Platinum From the Other Precious Metals.** Georges Auguste Louis Robert Collard, Vienne, (Isere), France, assignor to Comptoir Lyon-Alemand, Paris, France, a Joint-Stock Company of France.

A process for separating platinum from gold and silver which consists in forming a mixture of goldsmith's ash, lead oxide, matte, slags of silica, iron oxide and calcium compounds, thio-oxidizing agents and metallurgical coke; adding copper to said mixture sufficiently in excess of the amount affected by the thio-oxidizing agents in order to fractionally separate the platinum; fusing the mass obtained; and cooling said mass.

1,808,188. June 2, 1931. **Process of Pickling Metals.** Deal H. Tompkins, Nitro, W. Va., assignor to The Rubber Service Laboratories Company, Akron, Ohio.

A process of pickling a metal which comprises subjecting the metal to be pickled to the action of a substantially non-oxidizing mineral acid solution containing a small proportion of an organic acid derivative of a reaction product of sulfur dioxide and an aldehyde-amine product.

1,808,200. June 2, 1931. **Cleansing and Preserving of Metalic Surfaces.** Thomas W. Bartram and Deal H. Tompkins, Nitro, W. Va., assignors to The Rubber Service Laboratories Company, Akron, Ohio.

A process of pickling iron and steel products which comprises subjecting the metal to be pickled to the action of a sulfuric acid solution containing a small proportion of a sulfonated aldehyde-amine reaction product.

1,808,370. June 2, 1931. **Apparatus for Extruding Seamless Brass and Copper Tubes.** Nyle R. Munson, Waterbury, Conn.

In an apparatus for continuously casting a metal tube, a vessel containing a supply of molten metal, a casing connected with said vessel, a mandrel within said casing, a water jacket on the outer section of said casing to cause the metal to congeal in the outer end thereof, whereby a solid tube may be continuously drawn from said casing, said vessel and casing being enclosed by a furnace for maintaining the temperature of said metal above the melting point, and a sliding door in said casing adapted to cut off said water jacket and the outer section of said casing from the hot gases of said furnace.

1,809,137. June 9, 1931. **Automatic Conveyer and Transfer Mechanism.** Constantine G. Miller, Chicago, Ill., assignor to The Meaker Company, a Corporation of Illinois.

A conveying and transfer mechanism comprising a conveyer chain provided with fingers for moving a work rod in one direction along a trackway said chain having an overhead return, means comprising endless chains for maintaining said rod in contact with said fingers during the vertical portions of said overhead return and a channel member for maintaining said rod in contact with said fingers during the horizontal portion of said return.

1,809,138. June 9, 1931. **Automatic Chromium Plating Machine.** Constantine G. Miller, Chicago, Ill., assignor to The Meaker Co., a Corporation of Illinois.

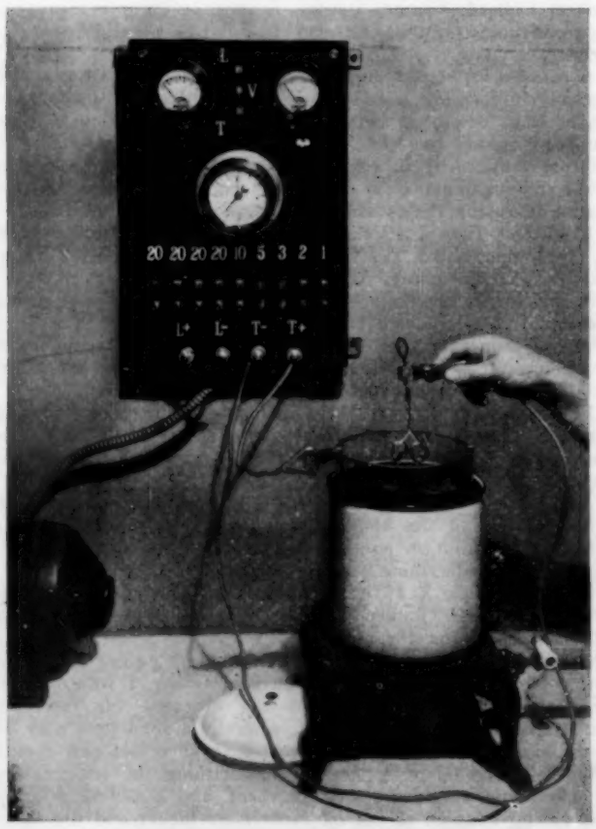
An automatic chromium plating machine comprising a platink tank, a trackway along said tank, said trackway having a bus-bar section and insulated sections outside of said bus-bar, a work rod having a conductor shoe sliding on said guide-way.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Rhodium Plating Demonstration

A group of members of the United Electroplaters Protective and Benevolent League recently visited the offices and laboratory of Sigmund Cohn, 44 Gold Street, New York, where they were shown a demonstration of rhodium plating. The process used was one which the Cohn firm has developed and for which it supplies the equipment and materials. The visiting platers were given a talk on rhodium metal by Adolph Cohn, and then heard a technical discussion of rhodium plating by Lionel Cinamon. The latter out-



A Cohn Rhodium Plating Outfit

lined the rhodium plating process, stressing the ease of operation. The Cohn process operates at room temperature, making it very suitable for plating objects made in part of celluloid or other materials which might be affected by a heated solution. During the demonstration, some silver teaspoons were rhodium plated and distributed to the visitors. Questions were asked by the visitors and these were answered by the firm's experts. The durability of rhodium plate was demonstrated by plating copper strips which the visitors were permitted to subject to polishing wheels. The rhodium showed high resistance to such abrasion. It was stated that certain metals could not be plated with rhodium; these include chromium, iron, tin, cadmium, lead, antimony and such soft metals as Britannia, white metal, etc. Such metals must first receive a silver, nickel, copper, gold or other plate which in turn may be rhodium plated.

It was stated during the demonstration that so far as the Cohn concern could discover, no patents had been granted on a rhodium plating process. The bath used during the demonstration, it was stated, was covered by a patent pending, but no actual patents had been granted on a rhodium solution. The Cohn firm told the platers that no fee is charged for a license to use the bath it has developed, and that no license fee is contemplated. Various sizes of rhodium plating installations were on exhibit, as well as a group of platinum and platinum metals in various forms.

Stoneware Acid-Resisting Rolls

General Ceramics Company, 71 West 35th Street, New York City, have placed on the market a new type of acid and temperature resisting material known as "Pyrotone." This material is being used for a new type of rolls for various applications. Of interest to the metal lines is the availability of these rolls for guides in cleaning of wire and allied products. "Pyrotone" rolls are stated to be suitable for use where equipment is required to withstand chemical and thermal shock. The rolls have a soft body covered with a smooth, heavy glaze. They are perfectly round and straight and can be easily cleaned. The maker states they will not craze or crack under sudden temperature changes and no losses are incurred by damaged ends. Rolls are made in diameters ranging from 3 to 8 inches, in lengths up to 9 feet. Tanks and kettles of "Pyrotone" are also available, as well as other equipment for use where temperature conditions are severe.

The company has also placed on the market a line of hard stoneware rolls with a ground, highly polished surface. These are furnished with or without steel shaft. They are stated to be absolutely acid proof through and through.

New Low-Voltage Generators

The Columbia Electric Manufacturing Company, Cleveland, Ohio, has developed a line of direct current generators, low voltage type, standard voltages 12, 24 and 50 volts, kilowatt capacities ½ to 100 KW.

The general design, construction and appearance is similar to that of the standard 6-volt Columbia electroplating generators and incorporates:

Rolled steel, electrically butt welded frames.
Bracket bearing construction.
Double row Timken roller bearings.
Interpoles.

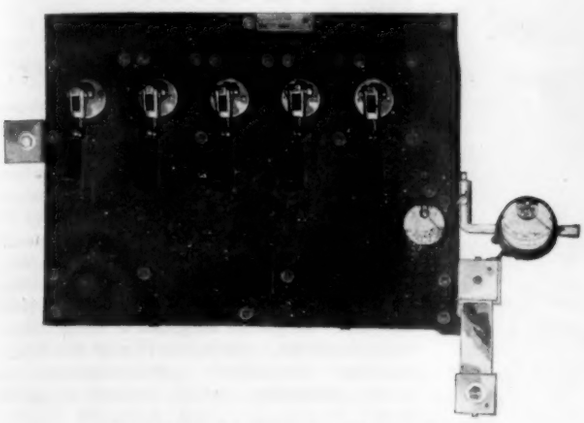
These generators are furnished either with self-excited or separately excited fields and are specially designed for electrolytic work. Generators specially designed for any purpose can be supplied.

Magnesium Metal Prices Again Reduced

Substantially reduced prices on magnesium metal have been announced by The Dow Chemical Company, Midland, Michigan. The new prices are 30c per pound in car load lots and 32c per pound in less than car load lots. This reduction has been made possible by process refinements through extensive research, production costs having been consistently reduced. The average price for magnesium metal for 1915 as reported by the Bureau of Mines was $5.00 per pound. Paralleling this progress in reducing production costs are equal advances made in fabrication methods in foundry and shop, the company states. Dowmetal (the trade name that identifies the magnesium alloys produced by The Dow Chemical Company) can be readily cast, rolled, drawn, forged, extruded, welded and machined by methods similar to those in use in metal working industries. Contrary to the opinion of many, magnesium is one of the most plentiful metals in the earth's crust.

New Plating Tank Rheostat

The Crown Rheostat and Supply Company, Chicago, Ill., has announced the addition to its line of a new type of plating tank rheostat known as the "Crown Toggle Switch Rheostat." The new rheostat, according to the maker, is designed along the lines of the old Crown rheostat, having a large number of steps of regulation, supplying uniform current control in the solution. The principal feature of the new product is the switch construction. This consists of a toggle switch on the face of the rheostat. The switch



New Type Rheostat for Plating Tanks

is also a new type, known as the brush type contact, which is said to be self-cleaning, insuring perfect contact at all times.

The maker states the rheostat is constructed with a minimum number of joints or contacts between switch and bus bars. Supporting braces for coils and contact for switch are all one piece, eliminating threaded or mechanical contacts. Switches are extra large, insuring ample current capacity without heating. This, with the perfect contact, it is stated, eliminates losses in the rheostat itself. The face of the instrument is neat, and can be furnished with voltmeter only or with ammeter as well as voltmeter. Ventilation is arranged to dissipate heat of coils. The instruments are made in ratings from 3 to 15 volts. Full information may be had by readers who should address the company.

Dust Collecting System

An improvement in dust collecting systems has been placed on the market by the Allington and Curtis Manufacturing Company, Saginaw, Mich., with branches at Chicago, Ill., New York City, and Boston, Mass. The improvement is known as the "Circuit-Clearing Main," which the manufacturer states is a radical departure in dust collecting. It is stated that with this new type of equipment, main never require rebuilding. Shifting of machinery or addition of new units can be accomplished without shutting down at all. It is also stated that there is no waste of power. Air at high velocity, mechanically conveyed, is employed in a highly efficient dust collecting method, according to the company. An added advantage claimed for the development is reduced maintenance and operating costs. The system is applicable to old systems as well as systems newly installed. Complete data will be presented to readers applying to the Allington and Curtis company.

"Heavy-Coated" Galvanized Sheets

Galvanized sheets of certified quality, carrying a zinc coating heavier than an average commercial sheet, are now available through completion of license agreements for the "Seal of Quality" trade-mark of the American Zinc Institute. Manufacturers licensed to use this "Seal" are the following: American Sheet and Tin Plate Company (subsidiary of U. S. Steel Corporation), Pittsburgh, Pa.; Continental Steel Corporation, Kokomo, Ind.; The Reeves Manufacturing Company, Dover, Ohio; The Youngstown Sheet and Tube Company, Youngstown, Ohio.

The matter is under consideration by other manufacturers of galvanized sheets, and a number of them, including Bethlehem Steel Company, Bethlehem, Pa., Granite City Steel Company, Granite City, Ill., and Newport Rolling Mill Company, Newport, Ky., have indicated definite sympathy with the movement, formal completion of license agreement being delayed by absence of officials.

The Zinc Institute "Seal" has been adopted as an emblem for heavily coated galvanized sheets for use as building material, as an aid to the buyer in securing long service and durability. (See page 360, THE METAL INDUSTRY, August, 1931.)

New Uses for Centrifugals

The Barrett Centrifugal Filwhirl Enameler, made by the Leon J. Barrett Company, Worcester, Mass., for enameling, japanning, painting and coating, will, it is stated, coat wide variety of articles of wood, fiber, or metal, weighing from a fraction of an ounce to several pounds. The saving in time, evenness of the coating, and freedom from drip and thick spots, together with bulk handling, shows a vast improvement in such operations. Articles are placed in the container and the coating materials enter the machine through a valve. The parts become immediately and completely coated. Any unused excess is thrown off, leaving only the desired even thickness of covering. Every corner and crevice becomes coated uniformly. Threads in tapped holes do not clog. Lacquering and painting of small articles, coils, etc., usually treated by other methods is almost instantaneous. The process appeals because it overcomes the difficulty of covering inside of hidden areas; also because of the cleanliness. There is no dripping after leaving the machine. The Barrett Filwhirl Enameler, it is claimed, has a large hourly capacity and requires only the minimum of floor space. The coating material may be run either hot or cold. Any excess of coating material over that used on the parts is returned to the supply tank, there being no wasted material whatever. Costs are most accurately arrived at and with care the most excellent quality of work can be done, although the Barrett Company makes claim only for quick bulk handling.

Articles to be impregnated are positioned and submerged in the impregnating fluid within the closed bowl or container, which is then rotated at a given speed. Centrifugal force acting radially from the axis of rotation presses the liquid against the wall of the container, thus building up and maintaining its maximum hydrostatic pressure at the largest diameter or at the solid rim, the pressure decreasing inwardly with reduction of diameter of the whirling mass toward the center, viz., a 24" bowl running at 1,200 R.P.M., fluid tight except for a 4" hole at the middle of the top containing a liquid the specific gravity of which would develop and maintain 90 lbs. hydrostatic pressure at the bowl rim, would gradually reduce to 34 lbs. on a 14" diameter and 0 at a 4" diameter or inner surface of the liquid wall, thus presenting an area or wall of fluid in which submerged articles would be subjected to an easily determined pressure, definitely calculable for any diameter, and as rotation continued, the liquid would be forced completely through the article toward the center at a rate depending upon the speed of rotation, the radius of the basket, the density of the liquid, and the permeability of the article. As impregnation progresses, obviously any air therein would be literally squeezed out toward the low pressure center opening.

Pickling Baskets and Crates

The Kirk and Blum Manufacturing Company, 2850 Spring Grove Avenue, Cincinnati, Ohio, offers to the metal fabricating and finishing industries a line of pickling baskets and crates in all types of material, such as steel, brass, copper, aluminum, nichrome, durimet, monel, Allegheny and other metals. The apparatus is made in all sizes and shapes for every type of application.

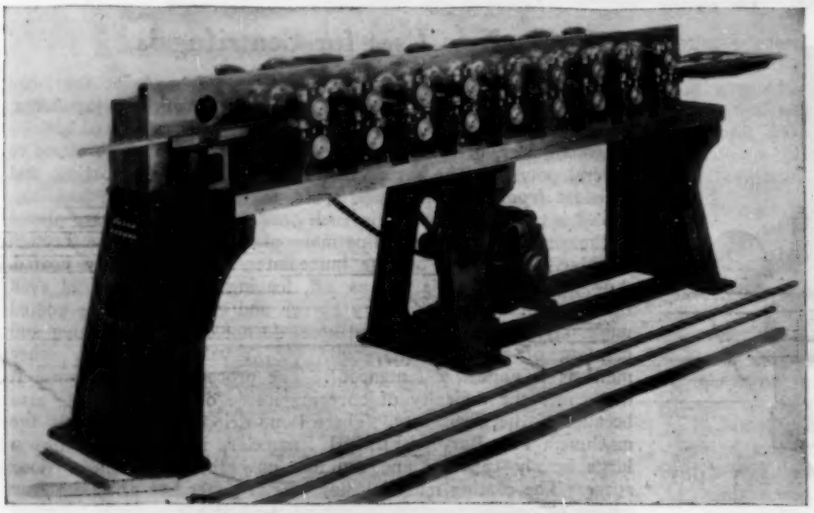
The company also manufactures lead-lined steel tanks and fume exhaust systems for electroplaters and finishers. Equipment is built especially to suit users' needs as well as in a great variety of standard styles.

Another specialty of this company is the manufacture and installation of dust and fume exhaust systems.

The company has headquarters at the Cincinnati address, as well as a plant at Detroit, Mich., an office at Chicago, Ill., and the following representatives: The Bushnell Machinery Company, 1501 Grant Building, Pittsburgh, Pa.; Liberty Blow Pipe Company, Inc., 325 Roland Street, Louisville, Ky.

Cold-Roll Forming Machine

Kane and Roach, Inc., Syracuse, N. Y., recently completed the design and experimental work of a cold roll forming machine necessary to economically manufacture a patented retainer strip for gypsum board, when it is used in place of wood or metal lath in building construction. It is claimed that there is much greater adhesion of the plaster to gypsum board than to ordinary wood lath and therefore less danger of cracking due to inadequate plaster anchors. The retainer strips are fastened to wood studdings by nailing through the center groove and to steel stud channels by means of clips on the solid back flanges. The material may be any suitable metal, such as brass, zinc, steel, etc.



Special Machine for Forming Strip Metal

The cross section of the strip, shown in Fig. 1, presents some interesting phases of cold roll forming, inasmuch as it was rolled complete with scalloped edges in one pass through the rolling machine at the rate of 100 ft. per minute, and held within close limits for straightness in all directions. It was also desired that the rolls be designed to permit of making retainer strips without scalloped edge, if required.

The retainer strip was formed both from planished stock and black finish strips 3 11/32" wide by .020" thick, in lengths up to 12 ft. It was also run from coil stock into long lengths cut to finished length afterward on a high speed cutoff, either toothed saw or abrasive wheel type. Fig. 2 is a photograph of the cold-roll forming machine used for this section. The main frame was made long enough to take in eleven stands, but only nine are required for this particular job. Machine is of standard construction having 1½" shafts, 4⅛" diameter rolls, 8" horizontal centers, and having a roll space on the shafts of 6". Outer bearings of a quick removable type are mounted on the guide support platform.

In order that the scalloped edge be of uniform width, the width of blank stock must be held within close limits and without camber, necessitating almost micrometer adjustment of starting guides to correctly align stock with the first set of rolls.

The shearing and forming of the scalloped edge is done simultaneously in the ninth set by the use of an intricately built up roll embodying forming rolls with shearing edges designed to allow for grinding on faces and return to proper positioning.

A trial run of 50,000 ft. of stock was made before shipment of machine to customer and cutters showed no signs of dullness and the sheared edges showed a clean cut, the maker states.

New Clear Metal Lacquer

A new type of clear lacquer for metal protection has been developed by E. I. du Pont de Nemours and Company, Wilmington, Del. The lacquer is the result of research carried on for the benefit of the hardware industry in an effort to develop a clear lacquer having the properties of minimum crystal spotting under the lacquer film on oxidized surfaces; minimum stain spotting on cast work; maximum resistance to deteriorating effect of outdoor exposure; maximum adhesion to metal; maximum hardness without sacrifice of flexibility; maximum flexibility; non-discoloration on aging; maximum tarnish resistance (green drip).

In a booklet the du Pont company has just issued the investigation and development is fully described, with illustrations and tables of scientific data. It shows how the new product was produced and tested. The new du Pont clear lacquer is known as "du Pont 1130 Metal Lacquer." The makers state that the product offers hardware makers the opportunity of improving lacquered products and increasing their salability by giving them a longer wearing and better appearing surface, as well as the possibility of lowering finishing costs materially. The booklet is available to readers addressing the company for it.

New Metal Polishing Paste

A new type of metal polishing paste known as "E-Z-Brite" has been placed on the market by the E. Wambaugh Company, Hawks-Gortner Building, Goshen, Ind. The paste is stated to be highly effcient in polishing automobile radiator shells, head lamps, bumpers and other metal parts which are nickel or chromium plated, or made of stainless steel, Monel metal, aluminum, brass, bronze, copper, etc. The paste is also used for polishing bathroom fixtures.

The company is desirous of securing dealers for retail distribution of the paste and offers a very remunerative discount to such dealers.

Full information is available to readers, who should address the manufacturer.

Equipment and Supply Catalogs

Cooling Fans. Buffalo Forge Company, 490 Broadway, Buffalo, N. Y. Fans for cooling hot places in industrial plants.

Lubrication. E. F. Houghton and Company, Philadelphia, Pa., 56-page booklet on industrial lubrication; leaflet on Oil Drip.

Annealing Furnace. W. S. Rockwell Company, 50 Church Street, New York. Bulletin on "Continuous Clean Annealing Furnace, conveyor type."

Rolling Mill Equipment. United Engineering and Foundry Company, Pittsburgh, Pa. A fine booklet on the company's thirtieth anniversary, profusely illustrated.

Polishing Compound. The Lea Manufacturing Company, 16 Cherry Avenue, Waterbury, Conn. A note book with pages dated for a month, handy for memoranda.

Pickling Equipment. Kirk and Blum Manufacturing Company, 2850 Spring Grove Avenue, Cincinnati, Ohio. Leaflet on baskets and crates, tanks, fume exhaust systems, etc.

Tool Room Machine. Keller Mechanical Engineering Corporation, 70 Washington Street, Brooklyn, N. Y. Illustrated folder on automotive equipment for making tools and dies.

Instruments. The Foxboro Company, Foxboro, Mass. Bulletin 174, 32 pages, fully illustrated, on controlling, recording and indicating instruments for temperature, pressure, humidity and flow.

Lacquer. Industrial Finishes Division, E. I. du Pont de Nemours and Company, Parlin, N. J. Booklet on development of du Pont 1130 Metal Lacquer, a clear lacquer for metal protection. Considerable information of interest to the metal and finshing industries is contained in the publication.

Gaskets. Victor Manufacturing and Gasket Company, 5750

Roosevelt Road, Chicago, Ill. Catalog H; 94-page reference book on all types of gaskets and packings for industrial and commercial uses. Fully illustrated; material grouped according to industries as well as otherwise; contains tables and engineering data.

Instruments. C. J. Tagliabue Manufacturing Company, Brooklyn, N. Y. General catalog, 100 pages, showing complete line of Tagliabue indicating, recording and controlling instruments for temperature, pressure, etc.; dials, thermometers, hydrometers, oil testing instruments, and moisture meters. Considerable engineering information is included. Readers can obtain this interesting publication by addressing the company and requesting the "Tag General Catalog No. 1000 MI."

Aluminum Paint. Aluminum Company of America, Pittsburgh, Pa. New booklet on painting with aluminum.

Rhodium Plating. Sigmund Cohn, 44 Gold Street, New York. Leaflet on process and equipment.

Celoron Gears. Continental Diamond Fibre Company, Newark, Del. Catalog of laminated fibre gears.

Cold Finished Bars. Joseph T. Ryerson and Son, Inc., Chicago, Ill. Illustrated bulletin on cold finished steel bars.

Safety. National Safety Council, 20 North Wacker Drive, Chicago, Ill. Two pamphlets, "The Safe Worker" and "The Safe Driver."

Blowers and Pumps. Roots-Connersville-Wilbraham Division of International-Stacey Corporation, Connersville, Ind. Heavy equipment.

Metallizing. Metallizing Company of Los Angeles, Ltd., 1218 Long Beach Avenue, Los Angeles, Calif. Molten metal spraying. Leaflet.

Lathes. South Bend Lathe Works, South Bend, Ind. New general catalog, No. 92; 128 pages, illustrated, describing the Series "O" line of 9 to 18 inch lathes.

Bright Annealing. Process Engineering and Equipment Corporation, 5 Falmouth Street, Attleboro, Mass. Equipment for bright annealing without oxidation, cleaning, pickling or drying.

Nova Scotia. National Development Bureau, Department of Interior, Ottawa, Canada. 157 pages, illustrated, with map, on resources and development of this Canadian province. Free on request to the Bureau.

Protective Coating, Liquilox Company, Ltd., 576 Subway Terminal Building, Los Angeles, Calif. Leaflet on a new liquid for protecting metals, fabrics, wood, etc., from acid or alkali corrosion, heat, water or other attack.

Nickel. International Nickel Company, 67 Wall Street, New York. Literature and patent references to nickel, compiled by J. S. Negru. Prepared for binding in loose leaf folder. Excellent technical bibliography and international patent list.

Ornamental Iron. J. G. Braun Company, 537 West 35th Street, New York. Portfolio of detail showing good practice in ornamental iron work; part of a special campaign of this company in the interests of its industry as well as architecture.

Plated Sheet Metal. American Nickeloid Company, Peru, Ill. Attractive little folder containing samples of "Nickel Brass" and "Chrome Brass," highly polished plated sheet metal for production purposes.

General Electric Company, Schenectady, N. Y., publications: Float Switches for Use with Automatic Pumping Equipment for Water-Level Control; Plastic Products; G-E Thrustor; Textolite Laminated; Cetec; Time Meters; Blast Gates; Magnetic Switches; Arc Welders; Arc Welding in Industry; General-Purpose Automatic Time Switch.

Metal Cleaning. The J. B. Ford Sales Company, Wyandotte, Mich. A 40-page illustrated booklet covering the well known "Wyandotte" line of metal cleaners. The booklet covers a very wide variety of topics, giving considerable technical data on metal cleaning of various kinds. Readers may obtain the booklet by addressing the Ford company and requesting the new catalog "MI.," and it is well worth the attention of anyone interested in the subject of cleaning metals.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

National Metal Congress

Headquarters, Commonwealth Pier or Statler Hotel, Boston, Mass.

National Metal Congress programs of the American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and the American Welding Society will be held from September 21 to September 26, 1931. It will be located this year in the spacious Commonwealth Pier, conveniently near the Hotel Statler, headquarters of the American Society for Steel Treating, the American Institute of Mining and Metallurgical Engineers and the American Society of Mechanical Engineers, and the Hotel Copley Plaza, chosen by the Welding Society as headquarters.

More than 200 firms have reserved space in the Exposition which will cover 60,000 square feet this year, almost twice as large as the 1930 show. The exhibits will display the latest equipment and products of the metal industry to the 75,000 metal men who are expected to view them during the course of the week.

Non-Ferrous Program

Institute of Metals Division technical program will include the following papers:

1. Copper and Copper Alloys Session.

"Some Important Factors Controlling the Crystal Macrostructure of Copper Wire Bars," by L. H. DeWald.

"Copper Embrittlement," by L. L. Wyman.

"Effect of Secondary Copper on the Metal Market and Its Relation to Domestic Production and Consumption," by Percy E. Barbour.

"An Alpha-beta Transformation in a Hot-forged Brass Shape," by Robert S. Baker.

"Equilibrium Diagram of the Copper-rich Copper-silver Alloys," by Cyril Stanley Smith and W. Earl Lindlief.

2. General Session.

"Influence of Stress on Corrosion," by D. J. McAdam, Jr.

"Preferred Orientation Produced by Cold Rolling in Sheets of Aluminum, Nickel, Copper and Silver," by Cleveland B. Hollabaugh and Wheeler P. Davey.

"Relation of Crystal Orientation to the Bending Qualities of a Rolled Zinc Alloy," by Gerald Edmunds and M. L. Fuller.

"Seasonal Variation in Rate of Impingement Corrosion," by Alan Morris.

3. Joint Session.

"Some Developments in High-temperature Alloys in the Nickel-cobalt-iron System," by C. R. Austin and G. P. Halliwell.

"Preparation of a Uniform Abrasive for Metallographic Polishing," by J. L. Rodda.

"Age-hardening Copper-titanium Alloys," by F. R. Hensel and E. I. Larsen.

"Age-hardening of Austenite," by F. R. Hensel.

A further feature will be a non-technical talk, "Molybdenum," by Alan Kissock, vice-president, Climax Molybdenum Company.

The American Welding Society plans a series of six sessions with interesting papers at each. The subjects to be discussed are: Manual and Automatic Welding, Welding ot Non-ferrous Metals, Corrosion Resistant Steels, Welding of Machine Parts, Annealing, Welded Piping, Welding in Ship Construction, Welding Structural Steel, and other general applications. On Monday the first session will be the meeting of the special committee on steel welding.

The American Society for Steel Treating will present two papers on non-ferrous metals, as follows:

"Hardness of Chromium as Determined by the Vickers-Brinell, Bierbaum, and Mohs Methods," by Richard Schneidewind, University of Michigan, Ann Arbor, Mich.

"Precious Metal Alloys," by R. C. Brumfield, Cooper Union, New York City.

Safety Congress and Exposition

HEADQUARTERS, NATIONAL SAFETY COUNCIL, 20 NORTH WACKER DRIVE, CHICAGO, ILLINOIS

During the week of October 12 to 16, hundreds of delegates of the metal industries of the United States will meet at the Stevens Hotel, Chicago, Ill., to carry out a cooperative program planned to consider practical ways and means for the reduction of accidents and accident costs in these industries. This accident prevention program, as an important part of the Twentieth Annual Safety Congress and Exposition, will be conducted by three different cooperative groups of the National Safety Council—namely, the Metals Section, the Automotive and Machine Shop Section, and the Power Press Section. In the total these three groups officially represent about 1,700 different industrial organizations which employ between two and three million workers. These organizations include about one-third of the total membership of the National Safety Council and these three sections have been pioneers in the promotion of the "national safety movement."

The Metals Section, in four half-day Congress sessions will feature some of the leading safety authorities in this field. This program will include "Analysis of Accident Causes in the Metal Industry," by C. P. Waite, The Travelers Insurance Company; "Hand Labor and Trucking"; "Good Eyesight Essential in Industry"; and "Good Housekeeping." One afternon session will be devoted to the safety problems of the foundry, with an address on "Cleaning in the Metal Industry" by Dr. Leonard Greenburg, Yale Medical School. There will be an educational film strip, and a motion picture showing the "Conveyorized Foundry System of the General Electric Company." Another session will feature "Outstanding Facts of the Metals Section Safety Contests and Award of Certificates."

The general safety exhibit of interest to all industries will include fire protection equipment, safety ladders and scaffolding, leather safety appliances and belts. There will be a display of such efficiency equipment as electric floor scrubbing and polishing apparatus, improved industrial lighting, improved chair and other devices to lessen fatigue. There will be exhibits of factory sanitary equipment, safety emblems and trophies and awards, and extensive displays of first aid materials.

National Research Council

HEADQUARTERS, 29 WEST 39TH STREET, NEW YORK

Machinery company executives will be among members of a party of one hundred business men and bankers, who will make a tour of research laboratories under the auspices of the National Research Council early this Fall. The tour is being organized to give the visitors an opportunity to see what industry generally is doing in the scientific research field. Interest will be directed to the use of research by small industries as well as large as an aid in solving industrial and financial problems in a period of changing business conditions.

Society for Testing Materials

HEADQUARTERS, 1315 SPRUCE STREET, PHILADELPHIA, PA.

Tests for Corrosion of Non-Ferrous Metals

A.S.T.M. Committee B-3 on Corrosion of Non-Ferrous Metals and Alloys, whose secretary is Sam Tour, has sponsored the preparation and distribution of 16,000 specimens of many different materials. These will be exposed in nine outdoor test locations and in four different liquid immersion test locations for exposure tests.

The committee plans to review data which was obtained on accelerated corrosion tests and to write recommended practice instructions for total immersion, alternate immersion, spray and accelerated electrolytic tests together with a critical review of each.

Committee on Light Metals and Alloys

The work of A.S.T.M. Committee B-7 whose chairman is J. B. Johnson, involves chiefly aluminum, aluminum alloys, and magnesium-base alloys. The committee has prepared several specifications covering aluminum-alloy wire, rods and bars and has submitted specifications for magnesium-base alloy sheet and magnesium-base alloy wrought shapes.

The committee is contemplating the preparation of specifications for aluminum alloys in the form of forgings suitable for engine crankcases, locomotive parts and miscellaneous forgings. A specification for Alclad, an aluminum-coated material, is under preparation.

This committee is also arranging to carry on a series of tests to ascertain the best methods of determining the proportional limit for cast and wrought light alloys.

Ohio Foundries Association

HEADQUARTERS, 443 PENTON BUILDING, CLEVELAND, OHIO

Plans are being outlined by the Ohio Foundries Association for a six-month safety campaign in nearly 600 foundries of the state, according to Robert Hoierman, secretary of the association. The campaign will be held in conjunction with the Ohio Department of Safety and Hygiene in an effort to reduce the industrial insurance rates.

Plans for the campaign were outlined shortly after the Ohio Industrial Commission announced a deficit of $706,796 in four foundry classifications and increased the iron foundry rate 25 per cent and the nonferrous foundry rate 33 1/3 per cent in an effort to reduce this deficit by nearly half a million dollars. Although the steel casting and malleable iron classifications showed deficits, these rates were not increased. A. H. Kramer, president of the Advance Foundry Company at Dayton, is general chairman and J. W. Beall, insurance commissioner of the Ohio Steel Foundry at Lima is assistant general chairman of the campaign.

Waste Material Dealers

HEADQUARTERS, TIMES SQUARE BUILDING, NEW YORK

At a conference July 28, 1931, between members of the trade press and Charles M. Haskins, secretary of the National Association of Waste Material Dealers, and Fred Tillberg, purchasing agent of the Ajax Metal Company, Philadelphia, the question of adopting and quoting a uniform scrap nomenclature throughout the country's markets was discussed. Decision was made that Benjamin Friedman, chairman of the Metal Division of the association, appoint a committee consisting of representatives from various sections to canvass the trade and agree on revisions and additions to the nomenclature used in the division's standards of specifications. The uniform nomenclature, when adopted, will be submitted to the trade press for criticism and for use. In the meantime the trade press was asked to employ terms as near in line with the division's specifications as possible.

American Standards Association

HEADQUARTERS, 29 WEST THIRTY-NINTH STREET, NEW YORK

The American Tentative Standard Safety Code for the Protection of Industrial Workers in Foundries, approved by the American Standards Association in 1922, is now being revised in order to bring the code up-to-date and advance it to the status of American Standard.

The revised code is being prepared under the sponsorship of the American Foundrymen's Association and the National Founders' Association.

Personals

Ellsworth L. Mills

Ellsworth L. Mills, formerly sales manager for The Bastian-Blessing Company, makers of welding equipment (torches, regulators, generators, etc.), has been elected vice-president of the company. Mr. Mills continues in charge of sales.

This appointment is not a surprise to those who have followed Mr. Mills' career. He has always been a leader, and has sponsored several movements to better conditions within the entire industry. As president of the Gas Products Association, he has done considerable to promote better marketing methods among all competitive companies. Mr. Mills' experience in welding dates back to days when, as a young engineer, graduate of Cooper Union Institute, he foresaw the possibilities in the development of the welding field, and he has devoted himself to this since that time.

ELLSWORTH L. MILLS

"The fact that only 20 per cent of the possible uses of welding are now employed indicates that the industry is far from the saturation point. Our greatest work is to educate the user to the full possibilities of welding," says Mr. Mills. "We will use every supporting medium to accomplish this. We will continue our research and augment our engineering facilities to meet future needs. Our sales staff will continue to spread the gospel as in the past.

"Because of the fact that it answers a real need, and because it employs modernized merchandising methods, the welding and cutting industry is forging ahead at a tremendous rate."

Joseph W. J. Meyer has been made foreman of the plating department of Driscoll and Company, Chicago, Ill.

H. A. Truslow, vice-president of the Armstrong Cork Company, Lancaster, Pa., has been made treasurer also, to fill the vacancy caused by the recent death of William H. Larimer.

L. A. Cornelius, president of the Wolverine Brass Works, Grand Rapids, Mich., has accepted the invitation of the National Research Council to join a party of one hundred leading business men and bankers on a tour of research laboratories starting from New York City, October 5.

W. H. McCartney has become associated with A. W. Smart, president of the Eureka Pneumatic Spray Company, 128 White Street, New York City. Mr. McCartney was formerly active in development and sale of industrial lacquers, and is an old friend of Mr. Smart.

C. W. Traughber has been appointed technical and metallurgical adviser of The Northern Blower Company, Cleveland, Ohio. Mr. Traughber was formerly with Anaconda Copper Company, American Smelting and Refining Company, and other large smelting plants for many years.

Obituaries

Ellwood L. Fine

Ellwood L. Fine, 68 years old, of 428 Rutherford Avenue, Trenton, N. J., for more than half a century connected with the Trenton Brass and Machine Company, Trenton, N. J., died on August 10, 1931, at his home, after a brief illness. Besides his widow, he leaves a son, Leslie, a brother, H. M. Fine, and a sister, Mrs. Naheniel Stratton. C. A. L.

Mark W. Bushnell

Mark W. Bushnell, former manager of the G. H. Press Company, and later president and manager of the Standard Metal Works Company, Thompsonville, Mass., died there August 25, 1931, in his sixty-eighth year.

News of the Industry

Industrial and Financial Events

Beardsley and Wolcott in Merger

Unanimous approval of the proposed merger of the Beardsley and Wolcott Manufacturing Company, Waterbury, Conn., and the Connecticut Electric Manufacturing Company of Bridgeport was given at the stockholders' meeting of the former company held at its offices August 7. Of the 66,000 total shares, 62,921 were represented at the meeting and all were cast in favor of the merger. A committee was appointed to put the plan into effect.

Expand Extrusion Department

Bohn Aluminum and Brass Corporation, Detroit, Mich., while making satisfactory progress in diversification, continues essentially a motor parts producer, doing slightly over 50 per cent of its business with the motor industry.

In 1930 the company developed the "Bohnalite" connecting rods, now in use on one make of car, with indications that several others will adopt them before the first of the year. President Bohn believes the company's greatest opportunity lies in the structural and ornamental field, which it entered early this year. In his opinion, Bohn Aluminum will be doing a bigger business in this line within three years than in all other lines combined.

Winchester Company Sells Reel Business

The Winchester Repeating Arms Company, Waterbury, Conn., last month received permission from the United States District Court to dispose of its fishing reel business and all of its material and machinery in an order signed recently. The purchaser of this department of the Winchester company is the Horrocks-Ebbotson Company of Syracuse, N. Y. Delivery was to be made shortly.

Aluminum Producers Plan Conference

According to advices from Hamburg, leading producers of aluminum will hold a conference soon. It is understood that British, Canadian and American producers have been invited to meet with the Continental interests with the object of forming a cartel.

German opinion is reported to favor a cut in the price of aluminum, corresponding to the fall in the price of copper, as the only effective means of reducing the heavy stocks of the metal, which German estimates put at 150,000 tons, according to the "Mining Journal" of London. Opposition to a cut in the cartel price is attributed to the Swiss and the British producers.

Brass Ingot Statistics

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute for the month of July, 1931, amounted to a total of 3,529 tons, according to announcement made by the Institute.

On August 1st, unfilled orders for brass and bronze ingots and billets on the books of the members amounted to a total of 21,510 net tons.

Metals from Secondary Sources

The value of certain nonferrous metals recovered from secondary sources in 1930 is reported to the United States Bureau of Mines, Department of Commerce, as $193,255,100, which is $137,773,800 less than in 1929, and the total quantity decreased 24 per cent. This decrease in value was partly due to the lower yearly average prices of copper, lead, zinc, tin, and antimony in 1930. There were, moreover, large decreases in the quantity of each of the secondary metals recovered.

Developments in Metals

DUTIES ON ALUMINUM and aluminum alloys entering Italy have been sharply increased, according to the Department of Commerce.

BABBITT METAL production in the United States in July, 1931, amounted to 1,931,585 pounds, as against 2,306,940 pounds in June, and 3,060,962 pounds in July, 1931, according to the Department of Commerce.

SPARKPROOF TOOLS of a special alloy known as Immadium bronze have been produced by a British implement firm. The tools are for use near explosive gases, and can be ground and forged hot.—A. C. B.

"ALFOL," a new heat insulating material made of crumpled aluminum foil, has been given exhaustive tests by the British National Physical Laboratory, Teddington, England.—A. C. B.

ALUMINUM sprayed on at 800° C. will produce a heat-resisting surface on iron, copper, brass or nickel.

RADIO CITY, now under construction in New York City, last month purchased 7,800,000 feet of copper wire from Anaconda Wire and Cable Company, and about 200 miles of brass and copper pipe and considerable other metal products from American Brass Company.

COPPER consumption will be considerably enhanced in the next few years by use of copper and brass materials in air conditioning systems, use of which is steadily increasing. It is expected that residences as well as other types of buildings will use such systems extensively.

ZIRCONIUM METAL is being used in larger quantities, according to the Bureau of Mines.

ALUMINUM SHINGLES are being used for making fireproof roofs. The shingles are said to be very protective against heat and cold, as well as fire.

ALUMINUM PAINT applied to roofs of railway refrigerator cars prevents absorption of heat to a much larger extent than the conventional "box-car red" paint generally used, according to tests by Canadian National Railways. Two cars have been completely painted with aluminum for test purposes.

ALUMINUM ALLOYS will be used through a new automobile soon to be put in production by the Peerless Motor Car Corporation, Cleveland reports state. Cars will be 12 and 16-cylinder types, with many entirely new features, including all-aluminum alloy bodies and other parts.

Machinery and Tool Workers' Course

A two-year course in training for young men desiring to become skilled workers in the machinery and tool industries is offered by the American Machinery and Tools Institute, 40 North Wells Street, Chicago, Ill. The course will be given at Lewis Institute, Chicago. Inquiries should be addressed to the American Machinery and Tools Institute.

New Companies

Concord Silversmiths, Inc., Concord, N. H., has been organized and subscriptions of $150,000 are being sought to start operations. On August 8, it was stated that $141,000 had been subscribed for stock. The firm was started by former employees of the Durgin division of the **Gorham Manufacturing Company,** which was closed last spring.

Carrolton Metal Products Company, Carrolton, Ohio, has purchased the plant there of the **George H. Bowman Company,** manufacturers of aluminum toys. New firm will make utensils as well as toys.

Corporation Reports

Yale & Towne Manufacturing Company—Three months ended June 30: Net loss after charges and depreciation $112,861, contrasted with a net profit of $7,947, equal to 2 cents a share on the outstanding stock, in the preceding quarter and a net profit of $24,140, or 5 cents a share, in the second quarter last year. Six months ended June 30: Net loss $104,914, contrasted with a net profit of $154,562, or 32 cents a share, in the first half of last year.

Federated Metals Corporation—Six months ended May 31: Net loss after interest, charges, depreciation and a reserve for market fluctuations in connection with metal inventories, $991,166, compared with a deficit of $212,789 in the six months ended May 31, 1930.

Anaconda Wire and Cable Corporation—Net profit for the half year was $279,693 after charges and taxes, equal to 66 cents a share, against $191,722, or 45 cents a share in the first half of 1930.

National Enameling & Stamping Company—Net loss of $270,921 in the first half of 1931 against a net loss of $13,542 in the first half of 1930.

International Nickel Company of Canada declared a quarterly dividend of 10 cents a share on common stock, payable September 30th to stock of record August 31st. This places stock on 40 cent annual basis against 60 cents previously.

Baltimore Tube Company—Quarter ended June 30, 1931, shows net loss of $4,199 after charges, depreciation and amortization, comparing with net loss of $15,422 in the preceding quarter, making net loss for the six months ended June 30th last, of $19,621.

Revere Copper & Brass, Inc.—Six months ended June 30th net loss of $144,058 after interest, depreciation, etc., against profit of $706,619 in the first six months of 1930. Profit for the first six months of 1930 was after miscellaneous charges, bond interest and depreciation. During the 1930 period $1,690,000 was charged for inventory adjustments to the reserve previously created for that purpose.

Aluminum Industries, Inc.—Earnings for the first six months of this year amounting to $102,600.94, equal to $1.02½ a share on the capital stock. The regular quarterly dividend of 37½c a share was declared by the directors, payable September 15th, to stock of record August 31st.

New Jersey Zinc Company—Three months ended June 30: Net profit after depreciation, depletion, taxes, contingencies and other charges, $865,252, equal to 44 cents a share on the outstanding stock, compared with $860,769, or 44 cents a share, in the preceding quarter, and $1,417,288, or 72 cents a share in the second quarter last year. Six months ended June 30: Net profit, $1,726,021, or 88 cents a share, compared with $3,089,155, or $1.57 a share, in the first half of 1930.

General Bronze Corporation—Six months ended June 30: Net profit after depreciation, interest and taxes, $21,478, equal to 8 cents a share on common stock, contrasted with net loss of $454,015 in first half of 1930.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

SEPTEMBER 1, 1931.

The **American Brass Company** has received contracts calling for 2,000,000 pounds of brass products with a valuation estimated at nearly $500,000. The major part of the order, consisting of brass pipe, sheet copper, bronze and nickel extruded shapes, sheet metal panels, etc., will be made here with remainder going to the Torrington and Ansonia plants. In addition to this, the Anaconda Wire & Cable Co. has received a contract for 750,000 pounds, most of which will be made at the Ansonia plant, formerly part of the American Brass, but now operated by the Anaconda Wire & Cable Co.

The two contracts are said to be the largest in history for building purposes and will be used in the construction of Radio City, the Rockefeller project in New York city.

The new wire mill erected by the **American Brass Company** at Ansonia is costing about $350,000 instead of $3,000,000 or $4,000,000 as has been rumored, the American Brass Company reports. The large estimate has much embarrassed the company. The mill is to replace several old three and four story buildings, some dating back to the Civil war and ready to fall down. They were unsafe for modern machinery and uneconomical for wire making as the modern tendency is toward one-story buildings of large area. All copper wire and cable operations of the American Brass Company have been turned over to the Anaconda Wire & Cable Company which will operate the wire plants at Ansonia and elsewhere. Little copper wire has ever been drawn in the local plants although a small business was conducted at one time in one of the **Holmes, Booth & Hayden** buildings. The Ansonia plant did most of this work. Consequently, no business will be lost to the Waterbury plants through the building of the new Ansonia mill.

Stockholders of the **Beardsley & Wolcott Manufacturing Company,** by a unanimous vote of all the shares represented, approved the proposed merger with the **Connecticut Electric Manufacturing Company** of Bridgeport at a meeting last month. The merger will be effected by the Industrial Managers, Inc. of New York taking over the stock of both concerns in exchange for stock in a new company. Under the plan, $200,000 or $300,000 is to be raised for new capital on first mortgage bonds. Holders of Beardsley & Wolcott debentures will receive for each $100 face value, debentures having a par value of $135 and one share of Class A stock in the new company. Common stockholders will receive one share of Class A and one share of Class B for each five shares now held. Class A will be entitled up to $1 a share annual dividends and after that Class B up to $1 annual dividends and thereafter both classes will share alike. Class B stock will be held under a five-year voting trust. The Bridgeport concern has been in receivership for some time and it is expected its business and machinery will be transferred to Waterbury.

The **Beardsley & Wolcott Manufacturing** has been made the defendant in a $2,000 action by **Julius Berbecker & Sons** of New York, who claim the local firm owes $1,750 for rent of a New York building.

The **American Brass Company** now allows its employes two smoking periods of 15 minutes each, daily. At 10 a. m. and 3 p. m. the whistle blows and the workers may smoke for the 15 minutes following. The officials feel that the relaxation afforded by these periods increases the efficiency and does away with frequent trips to the rest room.

Notice has been given by attorneys for the family of the late **Louise Pine** that suit will be brought in the federal court against the **Waterbury Clock Company.** The girl died on May 11 from a spinal tumor caused by radium poisoning.

The **Blake & Johnson Company** and the **Plume & Atwood Manufacturing Company** began last month to pay their employes by check instead of in cash. Most of the larger manufacturing plants have been paying by check for several years.

The **Lux Clock Company** has made a 10 per cent cut in the wages and salaries of its employes as the result of a slowing down of orders at the plant. A few months ago it was one of the busiest plants in the city, but the summer production has been so poor that all salaried workers who formerly were given vacations with pay had to take time off this year at their own expense.

Patents granted last month included one on a temperature control system and apparatus to **Morris H. Bennett,** who assigned it to the **Scovill Manufacturing Company,** one on a self-adjusting carpet fastener to **Paul Fenton,** assigned to that company, one on a sprinkler head to **Joseph F. Moran,** assigned to the same company, and one on a spoon to **Frederick Pretat,** assigned to the **International Silver Company.**

W. R. B.

Connecticut Notes

SEPTEMBER 1, 1931.

BRIDGEPORT—Directors of the International Silver Company have voted to close the local **Holmes & Edwards** plant, but the actual closing will not take place until after the Christmas trade. Most of the work formerly done here will be transferred to the Waterbury plant and the rest to the Meriden and Wallingford plants.

BRISTOL—Directors of the **Bristol Brass Corporation** have voted to call in 2,406 shares of the 7 per cent preferred stock which will be retired Oct. 1 at $110 a share. All holdings of five shares or less will be fully called and holders of six shares and more will be subject to call of 50 per cent of the stock held. The amount required to retire the stock is $250,000. The company now has a surplus of $850,000. The directors have also declared the regular dividend of $1.75 on the preferred payable Oct. 1.

HARTFORD—Veeder-Root, Inc. reports net income after taxes of $37,181 for the 24-week period ending June 20. Provision for depreciation amounted to $52,400. The company is now operating its die casting department 24 hours daily, seven days a week and has added 50 employes to its payroll during the past month. Production schedules require additional help before Oct. 1, it is said, because of large orders for voting machine counters, due to the passage of an act in Pennsylvania prescribing the use of voting machines.

TERRYVILLE—Officers and directors of the **Eagle Lock Company** were re-elected at the annual meeting last month. A surplus as of June 30 amounting to $1,710,997 was shown comparing with $2,006,555 a year ago. The statement lists all real estate, tools and machinery at but $100,000 although the town tax assessment is $2,000,000. Real estate on Warren street, New York, is carried at but $70,000 although it is said to be worth several hundred thousand dollars. It was announced that the company has not reduced the wages of its employes.

NORWALK—The **Segal Lock & Hardware Company** is operating 24 hours a day on new razor blades and a new one-piece razor taking double edges blades. Production schedules call for 10,000 daily compared with 5,500 daily on the older models. Daily production of blades is expected to reach 600,000 before the end of the year. The company has been granted patents by this country and foreign countries on the new model. President Louis Segal expects net profits for the year will exceed the $202,000 secured in 1930 which was after all charges and taxes.

NEW HAVEN—The Remington Arms Company of Bridgeport is said to be negotiating for the properties of the **Winchester Arms Company** here, according to **Saunders Nor-**

vell, president of the former concern. The local company is in receivership. It has recently been granted an abatement of $36,245 in its tax bill by the city. For a time the city threatened to foreclose the plant for the taxes.

SOUTHINGTON—Peck, Stow & Wilcox Company has announced a wage reduction of 10 percent, effective immediately. A previous cut of 10 per cent was made last October.

WINSTED—The plant of the **Winsted Insulated Wire Company** was sold at public auction by Judge H. H. Howd last month to the **Hudson Wire Company** of Ossining, N. Y., the price being $15,000. The local plant was recently appraised at $36,000. The Hudson Company has a claim of $28,000 against the company. **Judge P. B. O'Sullivan** has ordered a hearing on the application for approval of the sale of the assets and payment of the mortgage indebtedness of the company by the superior court at Hartford.

STAMFORD—The **Yale & Towne Manufacturing Company** reports for the quarter ending June 20, net loss of $112,861 after charges and depreciation compared with net profit of $7,947 equal to two cents a share in the preceding quarter. Net loss for the six months' period was $104,914 compared with a net profit of $154,562 or 32 cents a share fr the first half of 1930.

PLAINVILLE—The **Trumbull Electric Company** of this city has the contract for electric switches to be required on the two new steamships to be built for the Eastern Steamship lines.

PUTNAM—A representative of a New York corporation manufacturing electric lamps has been here inspecting the **Hammond-Knowlton Company** plant with the view of acquiring it for manufacturing operations. The company is said to employ 200 hands. W. R. B.

Middle Atlantic States

Central New York

SEPTEMBER 1, 1931.

An upward swing in production the first of next month is predicted by **F. W. Young,** Utica, who has just been appointed vice-president and supervisor of all manufacturing plants of the **Remington Rand Corporation.** Mr. Young's new appointment extends his field to cover the entire company of several plants and 15,000 employes.

Horrocks-Ibbotson Company, Utica, through acquisition of the fishing reel department of the **Winchester Repeating Arms Company,** New Haven, Conn., a deal confirmed this month, claims it will produce the largest line of fishing tackle in the United States, and probably in the world, when machinery is moved here and put into operation about November 1. The new department will employ about 50 workers who will be engaged from Utica, with the exception of a few key men in the shop who will be taken from New Haven. In 1920 the Winchester company took over the fishing reel business started by the **Andrew B. Hendryx Company,** New Haven, and last year it built and sold some 50,000 reels ranging in price from 50 cents to $15.

Saunders Norvell, president of the **Remington Arms Company,** has confirmed reports that negotiations are under way for the acquisition of properties of the **Winchester Repeating Arms Company,** now in the receivership. Mr. Norvell stated the probable date of agreement and the details of the plan could not be forecast at this time. Representatives of the Winchester properties have been attempting to find a purchaser ever since the companies went into receivership with interest on $5,747,000 gold bonds and $6,500,000 in debenture bonds forfeited. Foreclosure action by trustees for the gold bond holders are pending in Federal Court.

The Department of Standards and Purchase at Albany, N. Y., has awarded the **Rome Manufacturing Company,** division of the **Revere Copper and Brass, Inc.,** the contract to deliver to the state department of public works 14 power driven graders. This branch of the brass and copper concern is reported to be doing a good business.

A Federal court action which involves the use of a trademark brought against the **Oneida Community, Ltd.,** is a countersuit, according to the community officials. Interviewed last week they stated that in November, 1930, the Oneida Community brought suit in equity against the **International Silver Company,** charging that the International had falsely and illegally attacked the trademark rights in the name "Rogers," which the Oneida Community acquired in their purchase of **William A. Rogers, Ltd.** In reply to this suit, the International Silver Company has now brought a countersuit against the Oneida Community, stating they have infringed the trademark named "Rogers." The Oneida Community has been given until September 9 to answer the complaint, and the date for the argument before Judge Frank Cooper has been set for September 10. An injunction and appointment of a special master to determine the damages is asked.

Metal trade reports from Utica showed slight employment improvement in August, while reports from the Rome area were not encouraging. Tabulation of employment figures from the three major brass and copper plants in Rome showed that about 3,000 men were on the payroll in these plants. This was reported to be about 60 per cent of the normal employment. Some of the Rome plants are working only three days a week.

A stagger system is being used by the **Revere Copper and Brass, Inc.,** Rome division, and while the plant is not running on full schedule, 90 per cent of the employees are given full time or part time work, plant officials say. E. K. B.

Newark, New Jersey

SEPTEMBER 1, 1931.

Officials of the **Radio Products Corporation,** 548 South 11th Street, have been directed by Federal Judge Fake to show cause why an equity receiver should not be appointed to take over the company's assets. Counsel for the concern denied liabilities of the company were in excess of assets. Peter A. MacDonald, of Washington, a stockholder, claims the company's business is at a standstill and is being operated at a loss. The company was formed three years ago and in 1929 earned $500,000. It is said that the operating loss for the first five months of this year was $70,000. It is said that there are thirteen manufacturers of radio tubes purchasing the kind of parts manufactured by the company.

American Alloy Company, metallurgists and refiners of precious metals, has signed leases for a portion of the Industrial Office building.

Vice-Chancellor Fielder has appointed Barney Larkey receiver for the **North Jersey Fixture Company,** 312 Bergen Street, Newark. It is charged that the fixture concern's current liabilities amount to approximately $17,000, that cash on hand totals only $1,000, that defendants have discounted all its notes receivable amounting to $9,828 with finance companies to raise cash for operating expenses. It is said that the company cannot continue operations with benefit to its creditors and stockholders.

C. A. L.

Trenton, New Jersey

SEPTEMBER 1, 1931.

It is not enough in an injunction and receivership action to show that the defendant has been and is doing business at a loss, Vice-Chancellor Buchanan held in an opinion dismissing such a petition against the **Zobel Electric Company,** which has a plant at Garwood, N. J. The suit was brought by stockholders. In the present period of depression, it was pointed out, such a policy would spell disaster to many corporations. Either actual insolvency or inevitable and imminent future insolvency must be shown, said the court. The court said the defendant is a New York corporation with a factory and principal place of business in New Jersey. The vice-chan-

cellor declared that the company was not insolvent and that it owes very little money to creditors. It was formed ten years ago to manufacture electric motors. The sales of the company dropped from $250,000 in 1929 to less than $40,000 in 1930. The company has about $200,000 invested in securities.

The machinery and bank accounts of the **Viking Tool and Machine Company,** Belleville, N. J., were sold for $18,300 by Vice-Chancellor Berry in Chancery Court here to **Arthur M. Schmidt** of New York. The latter bought the plant for a group of former stockholders. The plant had been in the hands of a receiver for some time.

Following concerns have been incorporated here: **Ellis Metal Company,** $100,000, all kinds of metal, Perth Amboy, N. J. **Hudson Cast Metal Products Company,** 10,000 shares common, Hoboken. **Excello Machine and Welding Works,** $25,000, Paterson. **Monograve Company, Inc.,** metal, $15,000 preferred. **Jimco Chemical Company,** 10,000 shares no par, Toms River. **Doremus Sherow and Whitehead, Inc.,** chemicals, $25,000, Paterson. **Franklin Chemical Corporation,** 3,000 shares no par, Montclair. **Middlesex Welding Supply Company,** $100,000, New Brunswick.

C. A. L.

Middle Western States

Detroit, Mich.

SEPTEMBER 1, 1931.

So far as the non-ferous metal industry is concerned August has proven to be the dullest month that has been experienced in many years. Platers also have the same story to tell.

Economic conditions are so unusual that even those best informed hesitate to forecast for the future. With the advent of fall, however, everyone in this area is expecting some sort of a change for the better. Much in the Detroit territory, of course, depends on the trend of the motor car industry. Late fall usually brings activity in this field and it is possible that there may be a moderate revival in manufacturing again this year. At present many of the big plants are closed. One of the largest in this area has been inactive all through the month with no announcement as yet concerning the date of re-opening. Others are on a part-time basis.

The plating plants are following practically the same schedule, with more or less uncertainity as to the future. In general it is more or less a waiting and hoping game in every line of industry.

The **International Radio Corporation,** with fully subscribed capital of $50,000, has been organized in Ann Arbor, Mich., for the purpose of manufacturing radio receiving sets of a new and improved design. The company will use the plant formerly occupied by the **Arborphone Company.**

Announcement is made that substantial advances in income have been made by the **Bohn Aluminum and Brass Corporation** in the first two quarters of 1931. The company has been fortunately situated during the last few months and the outlook for the remainder of the year is just as favorable, it is stated. The low prices of raw materials also have been to the advantage of the organization and it is understood that a sizeable inventory has been accumulated at current low levels. It is one of the few concerns affiliated with the automobile industry to report increased profits this year. Eight factories are operated in or near Detroit by the Bohn organization or its subsidiaries. It manufactures aluminum and brass castings, including housings, crankcases, transmissions, pistons, bronze back and steel back babbitt-lined bearings, brass bushings, bearing gears, plumbing supplies, valves, automobile hardware and similar products. In addition to the automobile industry, the company's products are sold to vacuum cleaner and airplane manufacturers and other users of aluminum and brass products.

The **Timken-Michigan Company,** 3631 Parkinson avenue, Detroit, has recently been incorporated with a capital stock of $150,000. The owners are **R. J. Goldie, Fred Glover** and **W. C. Wood.**

The **Kelvinator** organization reports shipments for the month of July ran 49 per cent ahead of those for the same month in 1930, while current orders on hand the last of August were substantially greater than those at the same time in 1930, according to **H. W. Burritt,** vice president in charge of sales.

Michigan will not immediately follow Arizona's lead in adopting home-mined copper as the material of its automobile license plates, according to **Frank D. Fitzgerald,** Michigan secretary of state. The 1932 plates already are in process of manufacure, he stated. "It is something worth considering for the future," he added, "if the copper price stays at its present level."

The **Alaska Refrigerator Company,** at Muskegon, Mich., is planning an addition and alterations to its plant, it is announced. Manufacturing operations are being maintained without the usual midsummer slump, as the result of new orders recently received from the **Norge Corporation** and **Copeland Products, Inc.**

Production of gas cocks by the **Independent Gas Cock Company** has recently been started at Fort Huron. **C. Nelson Smith** is president and **P. E. Welton** secretary and treasurer. **Mr. Welton** is in charge of the plant.

The **Ford Motor Company** is constructing an all-metal airplane with a passenger capacity of 36, according to a recent announcement. The plane is said to vary in design from the 13-passenger models now being built by the same company. It is powered with four motors, all of which are mounted in the wings. The saving of air resistance obtained by the new type of engine mounting is expected to give the plane a cruising speed of about 100 miles an hour. At the same time it is expected to carry as great a proportion of pay load as the smaller planes.

George B. Essex, 62 years old, founder of the **Essex Brass Corporation,** and its president when he retired 15 years ago, died suddenly recently in Detroit. He leaves his widow and three brothers.

F. J. H.

Wisconsin Notes

SEPTEMBER 1, 1931.

Additional help has been added in both the Manitowoc and Chilton plants of the **Aluminum Specialty Company. Walter Spindler,** president of the company, has announced plans for the construction of a three-story factory addition to the Manitowoc plant. The new addition will measure 60x60 feet and will be of the latest fire-proof type of construction. It will be used for manufacturing and warehouse purposes.

George L. Vits was re-elected president of the **Aluminum Goods Manufacturing Company,** Manitowoc, at the annual meeting of the board of directors held in Chicago, Aug. 6. **A. J. Vits** was renamed vice-president and assistant to the president; **H. L. Vits,** vice president and director of productions; **Carl Isselmann,** director of sales; **Earl O. Vits,** assistant director of production, and **R. J. Findlan,** treasurer. **J. E. Hamilton,** Two Rivers, was elected chairman of the board for a year.

Approximately 3,000 pounds of stolen brass and copper, taken from the **American Brass Company** in Kenosha last year, was recovered from the Fox river near New Munster recently by several youths who discovered the loot while in swimming. The company hired the youths to bring the ingots out of the river.

The **Universal Foundry Company** of Oshkosh has been busy during the summer filling orders for bases for electric fans at the order of a Michigan concern. During a year between 30,000 to 40,000 fan bases as well as other aluminum parts are cast by the Universal company. Due to the heavy demand for fans during the summer, the Oshkosh concern experienced a busy season.

A. P. N.

Other Countries

Birmingham, England

AUGUST 17, 1931.

The Institute of Metals has issued a list of 25 papers to be presented at the annual Autumn Meeting at Zurich on September 14 and 15. The list is of record length, the number of papers normally presented at the meeting of the Institute being 15. A gathering of over 200 engineers and metallurgists from all continents is anticipated and they are offered a fine selection of essentially practical papers, three on wire drawing, two on unsoundness in aluminum castings, and others on bright annealing, hot galvanizing, failures in high strength brass, rolling of lead alloys, and heat treatment of duralumin. Following the meeting there will be a series of works visits and a party will proceed to Milan for the **International Foundry Exhibition.**

The improvement in the price of nonferrous metals following on the Hoover moratorium suggestions has proved to be temporary, and during July values of copper continued to decline. Users in the Midland district are holding off the market and most of the nonferrous rolling mills are maintaining operations with a few specifications against old contracts. Plumbers' brassfounders are better employed, but the fixture section is rather quiet. The nonferrous casters are expecting an inflow of business from the automobile manufacturers, who are already preparing for the important exhibition at Olympia later in the year.

Over two-thirds of the space available in the **British Industries Fair,** to be held in London and Birmingham next February, had been applied for by July 25. At Castle Bromwich, Birmingham, where the buildings are being extended to give a total exhibiting area of 250,000 square feet, 80 per cent of that space was let. It is at the Birmingham section that nonferrous metal producers figure prominently, and quite a number of the biggest firms in Birmingham and district will be exhibiting.

In the Birmingham district there is a scarcity of orders among all the industries using nonferrous metals, with the exception of the domestic electrical trade and the wireless instrument producers. In both cases the approach of the winter is responsible for a stir, but in the case of the radio trade the amount of nonferrous metals used is relatively small as most of the makers are using various materials coming under a group known as synthetic resins. F. J. H.

Business Items—Verified

Industrial Plants Corporation, Columbus, Ohio, will sell at public auction on September 15, the entire machinery, equipment, inventory, etc., of **Jenkins Vulcan Spring Company,** Richmond, Ind.

Aurora Metal Company, Aurora, Ill., is a manufacturer of die castings and nonferrous castings. Company maintains die shop, laboratory, tool room and casting shop, besides a bronze foundry.

The Yoder Company, Cleveland, Ohio, has made arrangements with Wm. Wulf Company, 850 Maccabees Bldg., Detroit, Mich., to act as Yoder sales representative in the territory of Detroit and vicinity.

Worthington Pump and Machinery Company, Harrison, N. J., announced a number of personnel changes last month, and some rearrangement of its organization, affecting several plants and offices, as well as certain sales divisions.

Eureka Pneumatic Spray Company, 128 White Street, New York City, announces a new sales policy, under which its products will be distributed by dealers in various parts of the country. Dealers will carry Eureka products in stock for immediate delivery.

M. Greenberg's Sons Brass Foundry and Machine Works, 765 Folsom Street, San Francisco, Calif., produces brass, bronze and aluminum castings and operates brass machine shop, pattern shop and plating, polishing, grinding and lacquering departments.

Lacer Corporation, Ltd., Los Angeles, Calif., succeeds the Lacer-Hallett Corporation, producers of nonferrous as well as gray iron castings and operating brass machine shop and tool room, in connection with its manufacture of air compressors, gasoline pumps and automobile hoists.

Udylite Process Company, Detroit, Mich., recently opened an office at 205 Wacker Drive, Chicago, Ill., for the purpose of supplying users of the "Udylite" process in that territory a prompt service. Also warehoused in Chicago are all "Udylite" materials, which assures users of immediate deliveries. **L. A. Davies** is in charge of sales, and **R. F. McGuire** service.

Republic Metalware Company, Newark, N. J., headed by **C. S. Shepard,** chairman of the board, has secured a majority of the capital stock of Central Stamping Company, Newark, N. J., maker of stamped tinware and kindred products. Company has tool room, spinning, stamping, zincing, tinning, soldering, grinding, polishing and japanning departments.

A-C Metal Specialties, Inc., 100 East Walnut Street, Milwaukee, Wis., has purchased all equipment and good will of Acme Automotive Accessories, American Sash Pulley Corporation, and Velguth Metal Parts, Inc. Company operates machine shops, tool room and stamping department.

Metal Products Corporation, New Haven, Conn., has been organized by **A. R. Stieler** and associates, and plans operation of factory for manufacture of metal cooking utensils, hardware products, etc. **Henry Braun,** 60 Chambers Street, New Haven, is interested in the company. Capitalization is $100,000. Departments to be operated include brass machine shop, tool room, stamping, polishing, grinding, lacquering and japanning.

Farrel-Birmingham Company, Inc., Ansonia, Conn., has opened a new office in Chicago at 1059 First National Bank Building, Monroe and Clark Streets, in charge of **Harry Temporal,** who was transferred from the Akron office. Mr. Temporal has been a sales representative of the company for 21 years. The Akron office, in charge of **Andrew Hale,** has been removed from the United Building to 2710 Central Depositors Bank Building.

Carran Foundry and Smelting Works, Inc., Ludlow, Ky., which was recently incorporated, is a new name which has been selected for the **R. B. Carran and Sons Company** which has expanded its smelting facilities. This foundry has been operating for over fifty years and has specialized in the manufacture of engine brass and car journal bearings, but has now added to its production of brass bearings, castings and babbitt metal, ingot metals of all analyses, and is rapidly building up a large volume of business in this line.

Paasche Airbrush Company, Chicago, Ill., announces the following changes: **L. Straub** is now manager of the New York office, 103 Lafayette Street; he is assisted by **G. M. Theuret, J. P. Creamer, G. C. Chatfield,** and **H. Abramson. E. Evans** is now in charge of the Philadelphia territory, with offices at 2401 Chestnut Street. **G. O. Thomas** is covering western Iowa again, and may be reached at 709 Olinda Avenue, Des Moines, Iowa. **A. C. James** has joined the Cleveland offices as manager, with offices at Room 604, Perry Payne Building, 414 West Superior Avenue, Cleveland, Ohio.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President Whitehead Metal Products Company, Inc., of New York

SEPTEMBER 1, 1931.

The month of August is usually a period of summer slackness and the past month was no exception. Because of the general business curtailment this August was slower than usual. However this was as expected and probably the slackness will continue till toward the middle of September. At that time some increase in activity is usually noticeable. It is anticipated that we will have a very good pick up this fall—somewhat more than seasonal.

Every day now that goes by brings nearer the time when real business improvement is bound to occur. The banking situation in this country is pretty well straightened out and our Federal Reserve Bank is in a position to take care of world needs. At the right time this country must and will finance the world.

The situation abroad is coming around slowly. Germany for the time being has passed the crisis and will probably not have a serious relapse. France needs no help. Austria has been helped as also several other continentals. England has just managed to effect a change of government that means much. From all of this it is apparent that slowly world conditions and situations are being handled by experts and gradually being solved.

Commodity prices have fluctuated with relatively narrow ranges. The grains, especially wheat, seems to be the weakest of all but even here who knows what sudden constructive movement might not entirely change the situation almost overnight.

The wrought metal business during the month of August was extremely quiet. The reason for this is that business during previous months was below normal and then with the seasonal summer slackening the slowness was emphasized.

Copper range boilers and copper equipped automatic storage water heating systems are going to consume a good deal of copper in the near future. Sellers of these commodities have found that in order to hold their market it is necessary to sell an article that does not rust.

Lighting fixture manufacturers have decided to abandon the cheap iron and plated fixtures and turn back again to the brass fixture where there is a possibility of maintaining a reasonable margin to carry on.

The hardware companies realize that good brass hardware is in demand and are going to specialize more on such equipment than during the past several years. The present price is making manufacturers as well as consumers think in terms of copper and brass even if they do not actually buy a lot of it. This speaks well for the future.

Aluminum sales have also fallen off slightly due to the seasonal slackening, but the fall pick-up will remedy the situation.

What is true of copper, brass, aluminum is also true of nickel and Monel as well as lead, zinc, etc. The demand for nickel and Monel however has not slowed down as much as the demand for the other products. This may be attributed to excellent exploitation methods followed by the nickel interests.

Taking the situation as a whole it is gradually improving. This fall should show a definite pick-up and permanent improvement. We are on the road back to better times.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

COPPER

SEPTEMBER 1, 1931.

Activity in the copper market was of restricted scope during August and ran at a rate much below normal. Price changes for domestic account were negligible most of the time. Demand was not vigorous enough to change the trend for the better, and consuming requirements were supplied at 7½ cents for nearby and forward shipment. The export quotation was reduced to 8 cents c.i.f. European ports early in the month. A fair tonnage was taken on this basis for foreign account, but the bookings for Europe totalled much below the average volume in previous months.

The last statistical report showing the amount of primary copper held by producers on July 31, disclosed the largest total on record, the amount being 440,417 short tons, or 880,834,000 pounds, of new refined copper. These figures revealed an increase of 26,943 tons from the total at the end of June, 1931, but they failed to have any pronounced influence on the market as it was conceded that there would be a large increase to accumulated supplies. A hopeful sign was the substantial decrease in production of refined copper to the lowest monthly rate in eight years. Total shipments, however, fell off sharply to 69,465 tons owing to curtailed consumption.

ZINC

On a moderate sales movement the market for zinc receded 5 points since August 1. Trading was of narrow proportions recently, but at present basis of 3.80c East St. Louis holders were not inclined to press sales. The statistical position showed further improvement by a reduction in stocks during July of 7,095 tons. This decrease in surplus stocks represents the difference between production during July of 21,365 tons and total shipments of 28,460 tons. The July output was the smallest since November, 1921. Stocks of slab zinc decreased 13,243 tons since February 1, but despite that fact the present carryover is 24,109 tons larger than a year ago, the stock on hand August 1 being 131,833 tons.

TIN

In the earlier part of August tin touched the low point for the month of 24.30 cents for prompt Straits tin. Developments of a constructive nature soon followed, however, and prices showed a steady advance until 26.30 cents was reached in the first fortnight. Consumers and dealers were aggressive buyers of both prompt and future positions at the higher prices. The local market was favorably influenced by the strong London tone and the heavy transactions recorded daily at that center. Recent price improvement in the foreign market amounted to over £12.12.6 per ton on big volume sales and on announcement that an international tin pool had been formed for the purpose of carrying a large portion of the excess stock. Four principal producing countries are reported to have concurred in this arrangement and also will continue the quota agreement made several months ago. The pool is believed to be financially strong and powerful, and the proviso is that no tin acquired by the pool will be sold until the spot price in London has averaged £150 (32½c per lb.) for a period of one month when 5 per cent of the pool stock can then be liquidated. Concerted action is now being taken to bring production and consumption in equilibrium. A strong market trend developed near the month-end with prompt Straits quoted 27 cents and futures 27¼c to 27½c according to position.

LEAD

Lead held steady lately at 4.22½ cents East St. Louis and 4.40 cents New York basis. These figures have been in force for two months, with buying in sufficient volume to keep values unchanged, although the London market did not contribute much encouragement. Sales for August and September shipment were made to the diversified trade consumers. Transactions during the past month represent a large tonnage, indicating that consumption requirements are at an encouraging rate. Stocks of lead were reduced 5,740 tons in July, making a total decrease from the peak figures at the end of May of 8,412 tons. Production for July amounted to 32,157 tons, or a rate much below the average output per month in many years. Corroders, cable and ammunition makers demands expanded at a substantial rate.

ALUMINUM

Price basis of ingot aluminum and remelted stock continues characteristically steady. Demand was in fair volume, and miscellaneous consumers have placed orders for substantial quantities. Aluminum is produced in commercial quantities in 10 countries. Of these, the United States is by far the largest producer, and last year Canada was the second largest producer, making North America the source of approximately 50 per cent of the world output of the metal. Germany was the largest foreign producer last year, with output of 30,900 tons. France stood second with 29,000 tons to its credit. Combined production of Switzerland and Norway totaled 42,900 tons in 1930, and Great Britain's production amounted to 19,400 tons. Six foreign countries form the international cartel, but rumors of price cutting by European producers presage a change when present agreements expire at end of year. Price stabilization is more difficult abroad than here. Production and consumption of aluminum in Italy more than doubled in the last three years. European authorities estimate stocks of aluminum in all producing countries at about 185,000 tons on July 1.

ANTIMONY

The general situation in antimony is steady, with spot Chinese regulus 6.60 cents duty paid. This compares with 6.65 cents in the early part of August and a low for the year of 6 cents in June. Floods in China make shipping conditions uncertain and offerings from the Far East were restricted. Warehouse stocks here are comparatively small and an active demand might easily create a better tone in the market. Bonded stocks August 1 were 1,954,743 pounds, the smallest in several years.

QUICKSILVER

Trading has been on a limited scale. Present price levels are somewhat irregular at $80 to $85 per flask and in some instances even lower prices were reported.

PLATINUM

The general situation in platinum is practically unchanged. Demand is mainly for small lots, with quotations for refined $37.50 to $40 per ounce.

SILVER

Silver has shown relative steadiness in market prices for the past month. changes were of a minor nature around 27¾ cents an ounce. Germany and India were recent buyers, but purchases are made with close attention to price on account of available supplies. World production for the first half of this year totaled 87,017,000 ounces as compared with 108,890,000 ounces in the first half of 1930 and represents a decrease in output of 21,873,000 ounces or 20.1 per cent. Leading financiers economists and statesmen are advocating a constructive program for the rehabilitation of silver. The silver problem is awakening world-wide interest as a right solution is vital to all nations.

OLD METALS

Following a period of few changes and rather dull conditions in the market for scrap metals, the demand for domestic and export account became more active and prices firmer lately. Buyers displayed more inclination to purchase desirable grades of copper scrap especially, but offerings have been rather scarce at the low range prices prevailing. Exporters and refiners have taken fair tonnages. Light copper and heavy brass were also in moderate request from consuming interests. Sellers are not eager to part with material at current quotations.

Daily Metal Prices for the Month of August, 1931

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	3	4	5	6	7	10	11	12	13	14	17	18
Copper c/lb. Duty Free												
Lake (Del.)	8.125	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875
Electrolytic (f.a.s. N. Y.)	7.625	7.50	7.50	7.625	7.625	7.625	7.625	7.50	7.625	7.625	7.625	7.75
Casting (f.o.b. ref.)	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25	7.25
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	3.85	3.85	3.85	3.85	3.85	3.825	3.825	3.825	3.825	3.825	3.80	3.80
Brass Special	3.95	3.95	3.95	3.95	3.95	3.925	3.925	3.925	3.925	3.925	3.90	3.90
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	24.45	24.85	24.40	24.30	24.90	25.125	25.10	26.00	26.30	26.20	26.00	25.70
Pig 99%	23.875	24.30	23.875	23.75	24.25	24.625	24.60	25.50	25.75	25.70	25.50	25.20
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.65	6.65	6.65	6.65	6.65	6.60	6.60	6.60	6.60	6.60	6.60	6.60
Silver c/oz. Troy Duty Free	28.00	28.125	28.25	27.875	27.75	27.125	27.125	27.25	27.125	27.125	27.125	27.25
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

	19	20	21	24	25	26	27	28	31	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	7.875	8.125	7.875	7.887
Electrolytic (f.a.s. N. Y.)	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.75	7.50	7.667
Casting (f.o.b. ref.)	7.25	7.25	7.25	7.25	7.25	7.50	7.50	7.50	7.50	7.50	7.25	7.298
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.85	3.80	3.818
Brass Special	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.90	3.95	3.90	3.918
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	25.55	25.80	25.75	25.80	26.35	27.00	27.10	27.00	27.15	27.15	24.30	25.754
Pig 99%	25.00	25.25	25.20	25.25	25.625	26.45	26.40	26.35	26.55	26.55	23.75	25.190
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225	4.225
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.60	6.60	6.60	6.60	6.55	6.60	6.60	6.60	6.60	6.65	6.55	6.610
Silver c/oz. Troy Duty Free	27.25	27.25	27.375	27.875	27.625	27.75	27.75	27.625	27.625	28.25	27.125	27.536
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

Metal Prices, September 8, 1931

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 7.875. Electrolytic, 7.50. Casting, 7.375.
Zinc: Prime Western, 3.80. Brass Special, 3.90.
Tin: Straits, 25.70. Pig, 99%, 25.05.
Lead: 4.225. **Aluminum,** 23.30. **Antimony,** 6.60.
Nickel: Ingot, 35. Shot, 36. Elec. 35. Pellets, 40.
Quicksilver: flask, 75 lbs., $85. **Bismuth,** $1.50.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price September 9), 28.00.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $37.50 to $40.00.

Duties: Copper, free; zinc, 1¼c. lb.; tin, free; lead, 2½c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

		Duty
Brass Ingots, Yellow	6¼to 7¼	45%
Brass Ingots, Red	7⅞to 9	45%
Bronze Ingots	9 to11	45%
Casting Aluminum Alloys	19 to22	4c lb.
Manganese Bronze Castings	18 to35	45%
Manganese Bronze Ingots	7½to11	45%
Manganese Bronze Forgings	26 to35	45%
Manganese Copper, 30%	20 to30	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	9 to12	45%
Phosphor Copper, guaranteed 15%	12 to16	3c lb.
Phosphor Copper, guaranteed 10%	11 to15	3c lb.
Phosphor Tin, no guarantee	20 to40	Free
Silicon Copper, 10%	20 to40	45%
Iridium Platinum, 5%	$43.00	Free
Iridium Platinum, 10%	46.00	Free

OLD METALS

Dealers' buying prices, wholesale quantities	Cents lb.	Duty
Heavy copper and wire, mixed	5⅜to 5⅞	Free
New copper clippings	5⅜to 5⅞	Free
Light copper	5 to 5¼	Free
Heavy yellow brass	3 to 3¼	Free
Light brass	2½to 2¾	Free
No. 1 composition	4⅞to 5⅛	Free
Composition turnings	4⅜to 5⅝	Free
Heavy soft lead	3¼to 3½	2⅛c. lb.
Old zinc	1⅜to 1⅝	1½c. lb.
New zinc clips	2⅛to 2⅜	1½c. lb.
Aluminum clips (new, soft)	13 to14	4c. lb.
Scrap aluminum, cast, mixed	3½to 4	4c. lb.
Scrap aluminum sheet (old)	9½to10½	4c. lb.
No. 1 pewter	15 to16	Free
Nickel anodes	22 to23	10%
Nickel sheet clips; rod ends (new)	24½to25½	10%
Monel scrap	6¼to 7¼	3c. lb.

Wrought Metals and Alloys

Effective August 4, 1931

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled		2½c. lb.
Mill shipment	17⅝c.to18⅝c.	
From stock	18⅝c.to19⅝c.	
Bare wire	9½c.to 9¾c.	25%
Seamless tubing	20⅛c.to21⅛c.	7c. lb.
Soldering coppers:		45%
Lots of 300 lbs. or more	16⅛c.	
100 to 300 lb.	16⅝c.	

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

	High Brass	Low Brass	Bronze	Duty
Sheet	15⅜c.	16¾c.	17⅛c.	4c. lb.
Wire	15⅞c.	17¼c.	17⅝c.	25%
Rod	13⅝c.	17¼c.	17⅝c.	4c. lb.
Brazed tubing	24¼c.		27¾c.	12c. lb.
Open seam tubing	23⅜c.		25⅛c.	25%
Angles, channels	23⅜c.		25⅛c.	12c. lb.
Seamless tubing	20¼c.	21⅛c.	21¾c.	8c. lb.

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	23⅛c.	10% Quality	26¼c.
15% Quality	25¾c.	15% Quality	30¼c.
18% Quality	26⅝c.	18% Quality	33¾c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.)

Tobin Bronze Rod	17⅜c.
Muntz or Yellow Metal Sheathing (14"x48")	17½c.
Muntz or Yellow Rectangular sheet other sheathing	17½c.
Muntz or Yellow Metal Rod	14⅝c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (September 9) 31.00, Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, open casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks, jobbers' price	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	7.25	2⅜c. lb.
Cut Lead Sheet (base price)	7.50	2⅜c. lb.

BLOCK TIN SHEET

(Duty free.)

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 12c. over N. Y. Pig Tin; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over.

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 10c. over N. Y. tin price; 100 lbs. to 500 lbs., 12c. over; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices F. O. B. mill. (Duty free.)

Supply Prices, September 8, 1931

ANODES

Copper:	Cast	18⅝c. per lb.
	Rolled, sheets, trimmed	17½c. per lb.
	Rolled, oval	15⅜c. per lb.
Brass:	Cast	18¾c. per lb.
Zinc:	Cast	10½c. per lb.

Nickel:	90-92%	44c. to 45c. per lb.
	95-97%	44c. to 47c. per lb.
	99%	46½c. to 49c. per lb.

Silver: Rolled silver anodes .999 fine were quoted September 9 from 31.00c. per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1″ to 2″	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full disc open buffs, per 100 sections, when purchased in lots of 100 or less:

11″ 20 ply 64/68 Unbleached	$19.47 to 20.28
14″ 20 ply 64/68 Unbleached	28.92 to 30.12
11″ 20 ply 80/92 Unbleached	24.35 to 25.36
14″ 20 ply 80/92 Unbleached	35.88 to 37.37
11″ 20 ply 84/92 Unbleached	34.17 to 35.59
14″ 20 ply 84/92 Unbleached	50.69 to 52.80
11″ 20 ply 80/84 Unbleached	31.32 to 32.63
14″ 20 ply 80/84 Unbleached	46.44 to 48.38
Sewed Pieced Buffs, per lb., bleached	46c. to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) Crystals	lb.	.07¾
Chromic, 75 to 400 lb. drums	lb.	.14¼-.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.15¾-.21¼
Denatured drums	gal.	.27-.33
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.04
Ammonium sulphate, tech., bbls.	lb.	.03½
Sulphocyanide	lb.	.36
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Cadmium oxide, 50 to 1,000 lbs.	lb.	.65
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.24
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16½-.17½
Cyanide (100 lb. kgs.)	lb.	.41
Sulphate, bbls	lb.	.043-.0475
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar, bags	ton	.04½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.19½
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.06¾
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¾
Silver Chloride, dry, 100 oz. lots	oz.	.24¾
Cyanide (fluctuating)	oz.	.32-.40
Nitrate, 100 ounce lots	oz.	.21¾
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.17
Hyposulphite, kegs	lb.	.03½-.04
Nitrate, tech., bbls.	lb.	.03¾
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Stannate	lb.	.24
Sulphocyanide	lb.	.32½-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.25½-.27
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¾
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½